HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
PESTICIDES PROGRAMS

DIVISION OF PESTICIDE COMMUNITY STUDIES

S. W. Simmons, *Director*
4770 Buford Highway, Bldg. 29
Chamblee, Georgia 30341

HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 500 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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72-0231. American Society of Agronomy; Crop Science Society of America, Soil Science Society of America. (677 S. Segoe Rd., Madison, WI 53711). **New Journal Accouncement.** *J. Environ. Qual. 1(1): 1; 1972.*

The *Journal of Environmental Quality* is a new journal concerned with the "protection and improvement of environmental quality in natural and agricultural ecosystems". It is published quarterly by the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America as a multi-discipline source of information in the environmental and agricultural sciences. The journal will accept review-type and symposium-type papers as well as technical reports. In view of the effect of pesticides on the quality of the environment, abstracts of pertinent articles will appear in the appropriate section of this and subsequent issues of HAPAB.

72-0232. Day, B. E. (California Agr. Exp. Sta., Riverside, CA). **Chemical week control in the seventies.** *J. Environ. Qual. 1(1): 6-9; 1972.*

The most widely used form of the pesticides are the herbicides. They are used not only in agriculture but also on industry related lands. The use of herbicides eliminates the expensive cost of more sophisticated types of weed-control and is also less hazardous. Technology in the 70's hopes to at least double the advantageous uses of herbicides. The lack of wide-range knowledge about herbicides, and shortage of trained personnel, limit the scope of further use of chemical weed control. Although, herbicides of the present are quite effective, they are far from being perfect but the future holds a great promise for new discoveries. The limitations of this discovery do not lie with technology but rather come from legal and social pressures. The public feels that the use of herbicides in agriculture is harmful in many respects and these views naturally lead to legal aspects which bring with it stringent restrictions and regulations. Therefore, the future of herbicides depends on society not technology.

72-0233. Metcalf, R. L. (University of Illinois, Urbana-Champaign, IL 61801). **Agricultural chemicals in relation to environmental quality: insecticides today and tomorrow.** *J. Environ. Qual. 1(1): 10-14; 1972.* (12 references)

Insecticides, purposeful environmental contaminants, are used in agriculture and hence benefit the farmer and the consumer by increasing the cost/benefit ratio in their favor. The use of insecticides has become the nucleus of public interest to conserve the quality of the environment. Insecticides have become a vital part of farm technology and will unavoidably lead to the monoculture approach to modern high production agriculture. These is a growing concern of environmental micropollution since the use of chemical insecticides has become so widely popular. It is imperative to learn more about the present day insecticides as well as the ones of the past which are still in use today. The future of pesticides is good, however, the poisonous, permanent chemicals will have to be replaced by biodegradable compounds. The extent of environmental pollution will be diminished by pest control specialists who will direct the pest management programs. Misuse and abuse of pesticides will also be best prevented by the supervision and prescription sale of pesticides.

72-0234. Torgeson, D. C. (Boyce Thompson Institute for Plant Research, Inc., Yonkers, NY 10701). **Fungicides and nematicides: Their role now and in the future.** *J. Environ. Qual. 1(1): 14-17; 1972.* (13 references)

To prevent losses from fungi and nematodes attacking plants, many fungicides and nematicides have been developed. In the advent of development these nematicides were volatile and phytotoxic which made it compulsory to be applied to the soil before planting. Now, however, the nematicides being developed are less toxic and can be applied to the plant. Inorganic sulfur and copper fungicides are still being used, these are not systemic, but many systemic, organic fungicides have been developed and will be more widely used in the future. Many more nematicides and fungicides are needed to control the parasites which present day fungicides and nematicides are not capable of doing; high cost of developing is the one major deterrent.

72-0235. McNew, G. L. (Boyce Thompson Institute for Plant Research, Yonkers, NY 10701). **Interrelationships between agricultural chemicals and environmental quality in perspective.** *J. Environ. Qual. 1(1): 18-22; 1972.*

The aspect of the role that agricultural chemicals play in assuring an adequate supply of food to the American people is discussed. It was foreseeable that agricultural chemicals would be in great demand when the amount of crop and livestock pests increased. All types of pest-averting devices, biological control devices, must be utilized as proficiently as possible. When these devices are disturbed, the use of chemicals becomes a form of crop insurance. Since these chemicals will be widely used in the future, safer and less toxic chemicals will have to be designed so that the environment will be spared.

72-0236. Anonymous. **A column of mercury: Part I.** *Food Cosmetics Toxicol. 9(1):140-141; 1971.* (17 references)

The transmission of mercury in the food chain and industrial mercury hazards are discussed. The occurrence of methylmercury compounds and methylmercuric sulfide in fish has been demonstrated, the

former apparently resulting from the biological methylation of inorganic Hg by microorganisms in fresh-water bottom deposits and the latter from conversion of inorganic Hg by salt-water bottom deposits. While fish are an important link in environmental comtamination by industrial mercury, birds may play a major role in transmitting Hg to the food chain from organomercurial seed dressing. Up to 4.0 and 79.5 micrograms/g Hg were found in muscle and liver samples, respectively, from pheasants who had eaten dressed seed containing an average of 16 ppm Hg. Other sources of mercury in the food chain are pigs fattened on Hg-treated seed grain and eggs from hens fed wheat containing methylmercury hydroxide, phenylmercury hydroxide, methoxyethylmercury, or mercuric nitrate. Many industrial processes carry an inherent risk of mercury contamination through inhalation or skin contact. Populations at risk include workers engaged in manufacture of organomercurial seed dressings, workers in mines and mills where Hg is prepared from cinnabar, workers in tungsten-rod factories, and dentists.

72-0237. Pryde, P. R. (Dept. of Geography, San Diego State Coll., San Diego, CA). **Soviet pesticides.** *Environment 13(9): 16-19; 1971.* (11 references)

Commonly used pesticides in the Soviet Union include DDT and other chlorinated hydrocarbons (schradan) geksakhloran (lindane BHC); mercaptophos; demeton (*Beta*-ethylmercaptoethyl diethyl thiophosphate); zinc phosphide; sodium arsenite; and other arsenic and fluorine compounds. Numerous environmental accidents due to pesticide use have occurred, including loss of wildlife and poultry. Complaints of food contamination have appeared in the press, and illnesses and deaths from the use of organic phosphate insecticides have also been reported. Because of the concern over the long-term effects of continued pesticide use, studies of their effects on humans are in progress at medical centers, universities, and specialized laboratories. Atmospheric standards for some phosphate insecticides have been established. Herbicides most commonly used in the U.S.S.R. are various forms of 2,4-D, DNOK (dinitro-*o*-cresol) and chlor-IFK (isopropyl chlorphenylcarbamate, CIPC) being used to a lesser degree. The herbicides, which are extensively used for brush control and conversion of brush or forest to pasture, have been implicated in the deaths of large forest animals. Possible birth defects and genetic changes from human exposure to critical amounts of certain herbicides are causing considerable concern.

72-0238. Hirst, E.; Bank, H. (National Science Foundation Environmental Program, Oak Ridge National Lab., Oak Ridge TN). **Striking the balance.** *Environment 13(9): 34-41; 1971.* (16 references)

Even though the Tennessee Valley Authority has been using 2,4-D to control watermilfoil since 1962, plans to spray Milton Lake, Tennessee, were abandoned when Oak Ridge citizens questioned this method of control and took the case to the Environmental Protection Agency. The lake is the city's only source of drinking water, and TVA officials could not guarantee 2,4-D concentrations of less than 0.01 ppm in drinking water supplies. Previous TVA experience showed typical concentrations of 0.01 to 0.10 ppm in water supplies. Milfoil, though a nuisance in man-made lakes, does not appear to present a public health hazard. Problems associated with its growth must be carefully balanced against the risks of control methods, particularly those involving chemical herbicides such as 2,4-D. While not interfering with the multipurpose uses of water in reservoirs, a 2,4-D spraying program is costly and only temporarily effective. Moreover, laboratory research shows that high concentrations cause birth defects in mammals, genetic effects in some plants, and may cause cancer in some animals. At present, a combination of dewatering and overwatering is an inexpensive method to control milfoil without producing ecological or public health problems.

72-0239. Bennett, G. W.; Walker, L. L. (Dept. of Entomology, Purdue U., West Lafayette, IN). **Where do we go from here? Indiana PCOs look at legislation and training.** *Pest Control 39(11): 9-16; 1971.*

Questionnaires were sent to 390 pest-control firms in Indiana to determine competencies of owners and service technicians, the extent of technician training, and the industry's attitude toward pest-control legislation. Both owners and technicians indicated that the skills needed in their jobs were greater than those actually possessed. Skills rated as much needed by both technicians and owners were an understanding of the hazards of improper insecticide use, the ability to use different equipment for insecticide application, and the ability to recognize the dangers involved with insecticides. Owners and technicians also felt that their knowledge of the ecological role of insecticides in the environment was much less than that needed. Half the technicians polled were trained for only one week to three months. Need for additional control legislation was expressed by 84% of the respondents. This realization of need is realistic in light of increasing legislation at both federal and state levels. Licensing of applicators was one area listed as needing more control. An appropriate educational process is in order if pesticide applicators are to meet proposed standards.

72-0240. Ueda, Kiichi (Dept. of Hygiene, Tokyo Dental U., Tokyo, Japan). **Environmental pollution due to pesticides.** *Asian Med. J. 14(8): 5-17; 1971.* (2 references)

Environmental pollution by pesticides is discussed together with acceptable daily intake (ADI) of pesti-

cides by humans. While farm products directly sprayed with pesticides are the most strongly contaminated, birds, fish, and useful insects are also damaged by pesticides in air and water. There is the danger that pesticides will destroy the balance of the biological environment by causing the disappearance of species without resistance to pesticides, followed by the reduction in numbers of living things that eat these species for food. Other species could begin to multiply owing to diminution of their natural enemies. Pesticides liable to cause environmental destruction are violently toxic organophosphate pesticides such as parathion, organochloride pesticides such as DDT and benzene hexachloride (BHC); pesticides that do not break down, including most organochloride pesticides; and metals, especially mercury, lead, copper, arsenic, and tin. Japan has established tolerances of nine pesticides in 14 food products, based on acceptable daily intake values recommended by the World Health Organization and the Food and Agricultural Organization. Compared with tolerances of other countries, including the U.S., the Japanese are the severest. Because of the tendency of *beta*-BHC to accumulate in subcutaneous body fat, the manufacture of BHC is no longer permitted.

72-0241. Johansson, H. (Author address not given) **Kemiska bekaempningsmedel - ett dilemma. [Chemical pesticides - a dilemma].** *Teknisk Tidskrift 101(15): 16-19; 1971.* (Swedish)

General description is given of the ecological system of living creatures. The originally stable ecological system of nature is disturbed by cultivating a small number of species of domesticated plants in agricultural areas. Pestiferous organisms are defined as plants, animals, or microorganisms noxious for materials necessary for man, or for man himself. According to an estimation by FAO, pestiferous organisms caused damages totalling 150,000 - 400,000 million Swedish crowns yearly to agriculture in the early sixties. A great number of methods and materials have been developed to control pests (fungicides, herbicides, insecticides, rodenticides). DDT had a major impact on the entire pesticide research, and industry. Some of the inconveniences involved in the use of chemical pesticides are low selectivity of many toxins, development of resistent insect phyla, and danger to warm-blooded organisms. Data are furnished on DDT-contents accumulated in aquatic organisms, and in man in different countries, and on the amounts of pesticides entering daily the human organism with food. Due to the slow decomposition, toxins are accumulating in the organs of living creatures. The accumulation factor lies at 10, approx. Mankind is reduced to the dilemma as to whether to abandon the use of pesticides poisoning nature and living creatures but so useful for agriculture by increasing crops, and face famine, instead. Pesticides should be used on the basis of a thoroughly elaborated strategy, and combined with other possibilities. Less harmful and more selective pesticides are required that decompose at higher rate. Possible solûtions are suggested, and newly developed pesticides, and methods are reviewed (luring substances repellents, special treatment of farm animals, breeding of resistant plants, biological control by using the natural enemies of pests, pest treatment with own hormones, sterilization). Satisfying solution requires thorough study of the ecology, and the action mechanisms of pesticides.

72-0242. Thompson, F. B. (Author address not given). **Insecticides. I. Materials available.** *N. Z. J. Agr. 4(123): 80-83; 1971.*

Registered insecticides on sale in New Zealand are classified by formulation (i.e., solids, liquids, gases), method of attack, and chemical composition. Examples are given for each main class within each classification. Of the three methods of classification, that by chemical composition is useful in understanding the regulations governing the sale and use of insecticides.

72-0243. Thompson, F. B. (Author address not given). **Insecticides. II. Toxicity and hazards.** *N. Z. J. Agr. 4(123): 84-87; 1971.*

Insecticides are classified in increasing order of hazard: slightly, moderately, highly, and very highly hazardous. The hazard of a chemical is the danger it presents under conditions of use and should not be confused with toxicity, which is the ability to injure living organisms. While the hazard can to some extent be predicted from the oral and dermal toxicity of the material, it varies according to the precautions taken. Thus a toxic material used carefully may be less hazardous than a less toxic material used carelessly. In general, pelleted insecticide formulations are less hazardous than dusts or sprays. Insecticide residues in food are dangerous only if the amount of the chemical consumed exceeds safe limits. Various countries prescribe limits, i.e., tolerances, for the maximum amount of insecticides or their derivatives in food for human consumption. In determining the tolerances for a particular food, a permissible level is deduced from the World Health Organization's acceptable daily intake (ADI) and the portion of that food in the national diet. If actual residues in food are less than the permissible level, they are frequently taken as the basis for the tolerance for that chemical in food. Insecticides that are particularly toxic to birds, fish, and bees are noted.

72-0244. Thompson, F. B. (Author address not given). **Insecticides. III. Legal aspects.** *N. Z. J. Agr. 4(123): 89-93; 1971.*

Legal restrictions governing the sale and use of insecticides in New Zealand are summarized. Under the Agricultural Chemicals Act 1959, insecticides cannot be

sold unless they are registered and bear labels accepted by the Agricultural Chemicals Board. The label must include the name and percentage of the active ingredient and carry warnings of the poisonous nature of the material. The Agricultural Chemicals Regulations 1968 provides that organochlorine insecticides cannot be sold or used without a permit from the Department of Agriculture unless exempt by a Notice. Endosulfan and fensulfothion are now exempt provided certain conditions are observed. The Regulations also restrict the sale, transport, and storage of mixtures of scheduled pesticides. In addition, they specify withholding periods to be observed between the last application of organochlorines and the grazing of an orchard. Spray and dust applications of insecticides toxic to bees are regulated by the Apiaries Act 1969. Maximum permissible amounts of pesticide residues in food are specified in the Food and Drug Regulations 1946 (and amendments) and the Food Additives Notice 1971. The sale, transport, and use of insecticides are also subject to provisions of the Poisons Act 1960 and Poisons Regulations 1964. Precautions to be taken by persons handling insecticides are stated in the Noxious Substances Regulations 1954 and subsequent Notices. Fish are protected from toxic insecticides by the Fresh Water Fisheries Regulations 1951.

72-0245. Thompson, F. B. (Author address not given). **Insecticides. IV. Properties, uses and restrictions.** *N. Z. J. Agr. 4(123): 95-1; 1971.*

Particulars are given for eight organochlorine insecticides and 37 organophosphorous insecticides registered for sale in New Zealand. Insecticides in each chemical group are listed alphabetically according to their common name. Information specific to each insecticide includes chemical name, trade name, properties, formulations, number of registered products containing the active ingredient, label claims, application rates, restrictions on use, poison designation, toxicity, and waiting or withholding periods. Information applicable to all insecticides in each group includes precautions and first-aid measures in cases of poisoning.

72-0246. Woodwell, G. M.; Craig, P. P.; Johnson, H. A. (Brookhaven National Laboratory, Upton, NY 11973). **DDT in the biosphere: where does it go?** *Science 174(4014): 1101-07; 1971.* (62 references)

The worldwide pattern of movement of DDT residues appears to be from the land through the atmosphere into the oceans and into the oceanic abyss. Calculations based on the fragmentary data available on rates of movement and sizes of various pools of DDT residues lead to the conclusion that concentrations in the atmosphere and in the mixed layer of the oceans lag by only a few years behind the amounts of DDT used annually throughout the world. A model suggests that maximum concentrations of DDT residues occurred in air in 1966 and will occur in the mixed layer of the oceans in 1971. The biota probably contains in total less than 1/30 of one year's production of DDT during the mid-1960's, a very small amount in proportion to the total potentially available. The reason for the biota's failure to absorb larger quantities and to be affected much more severely is unclear. The analysis suggests that mere good fortune has protected man and the rest of the biota from much higher concentrations, thus emphasizing the need to determine the details of the movement of DDT residues and other toxics through the biosphere and to move swiftly to bring world use of such toxins under rational control based on firm knowledge of local and worldwide cycles and hazards. (From author's summary by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0247. Gillette, R. (Author address not given). **DDT: In field and courtroom a persistent pesticide lives on.** *Science 174(4014): 1108-1110; 1971.*

Despite restrictions on the use of DDT, an estimated 11 million to 20 million pounds of the pesticide were used in the U.S. this year to control the bollworm and about two dozen other pests of cotton, citrus, soybeans and peanuts. That the controversy over the perils and benefits of DDT remains unresolved has been evident in the rancorous public hearings that the government has been conducting since August. The hearings are part of a complicated administrative appeals process invoked by the pesticide industry when the Environmental Protection Agency announced its intention to ban DDT, on the advice of a special panel of scientists. At the hearings, EPA had been aligned with conservationists and scientists and opposed by the presiding federal examiner as well as industry. Although EPA officials still seem to favor a ban on DDT, the final judgment may depend on political considerations. Instead of a ban, selective new restrictions may be imposed, reducing the legal application of DDT to about six insect pests.

72-0248. Gerlach. E. R.; Reist, W. (Muskingum College, New Concord, OH 43762). **Pesticides, environment and pollution. An interdisciplinary course for the interim.** *J. Chem. Educ. 48(11):763-4; 1971.* (8 references)

A multidisciplinary course in biochemistry and ecology was conducted during the interim for the purpose of acquainting students with the problems and some of the solutions of environmental pollution. The course covered the analysis of population problems, use of radioactive materials and various types of pollution. The role of pesticides in the current water pollution problem was discussed, with lectures on biological magnification in the food chain and the legal aspects of water pollution. Through numerous field trips to industrial and research facilities, this course permits extended

contact with the problems, and the institutions and scientists dealing with these problems, in a way not possible in the usual semester curriculum. Such an interim program sends back to the college community a core of informed individuals who continue to extend their activities to the campus and general community as a result of their experiences.

72-0249. Pierce, Jr., R. H.; Olney, C. E.; Felbeck, Jr., G. T. (Dept. of Food and Resource Chemistry, Univ. of Rhode Island, Kingston, RI). **Pesticide adsorption in soils and sediments.** *Environ. Lett. 1(2): 157-72; 1971.* (71 references)

Pesticide adsorption, dependent on the chemical and physical properties of the pesticide, as well as on the conglomeration of soil properties, is reviewed. Insight into the mechanism of pesticide adsorption is discussed, and several theories for the accumulation of chlorinated hydrocarbons are suggested.

72-0250. Walls, R. E. (Author address not given) **Pesticide pollution.** *Texas Law Rev. 48(6): 1130-68; 1970.* (250 references)

The problem of the effects of pesticide pollution and the governmental steps to repress it are considered. The means of supervision of pesticide pollution in Texas by the U.S. Geological Survey and the Texas Water Development Board are discussed and found deficient. The restricted supervision by the Texas Dept. of Health and Parks and the Wildlife Department is discussed. The measures to be taken to control pesticide pollution under federal and Texas laws are reflected. Transportation and regulation of the sale of pesticides, and direct and indirect control of pesticide use are some of the laws in the area. Proposed new legislation and the advantage of public education as a means of pollution control is contemplated. The lack of effective pollution control in the state is reproved and two effective means (direct regulation of the use of all pesticides, and proper evaluation of environmental hazards in the registration of pesticides for sale) of controlling pesticides are presented.

72-0251. Tatsukawa, R. (Ehime University, Matsuyama, Japan). **A new environmental pollutant-polychlorinated biphenyls (PCB)** *J.Pollut. Control. 7(5): 419-25; 1971.* (22 references) (Japanese)

The physical and chemical properties, physiological effects and toxicity, actual cases of pollution and analysis methods of PCB, a new environmental pollutant, are discussed. PCB is a biphenyl whose hydrogen has been substituted by chlorine. PCB is insoluble in water, it does not react with acid, alkali, or water, therefore, it is chemically inert. Organic solvents do dissolve PCB but it will never dry even when it is exposed to the air. PCB is fireproof, except with low chlorine compound content, and thermoplastic. Even at high temperatures PCB will not corrode smooth metal or glass and adheres well to them. PCB has a wide range of relevancy. Since it is highly heat insulating and dielectric, its most popular use is as a transformer and capacitor oil, insulator, carbon resistor and is also used as a coating for electric wire. It can be mixed with paint and varnish and forms a protective coating for lumber, metal, and concrete when mixed with asphalt and ethylcellulose. PBC's toxicity on fish is less than DDT even though its toxic effect is chronic rather than acute. Its toxicity has been reported to be 1/300-1/30 compared with DDT and 1/8000-1/1000 compared with Dieldrin. Its chronic effects are shown by describing marine pollution by PCB. PCB causes a skin disease called chloracne.

72-0252. Stokinger, H. E. (Lab. of Toxicology and Pathology, National Inst. of Occupational Safety and Health, Cincinnati, OH 45202). **Sanity in research and evaluation of environmental health.** *Science 174(4010): 662-665; 1971.* (26 references)

The economic and health consequences of unnecessarily severe standards for pollutants in air, water, and food are reviewed. Of the 18 major pollutants or groups of pollutants of concern to health-oriented groups, only eight are potentially hazardous, and not all of these with the same degree of certainty. In no case do pesticides, as found in the three environmental sources, belong on a list of pollutants of primary concern. Seven rules are given for making criteria and standards less worrisome to those being protected and more acceptable to those who must comply. Standards must be based on scientific facts; unnecessarily severe standards must be avoided; and all standards, guides, and limits, as well as the criteria on which they are based, must be completely documented. In addition, realistic levels must be defined for each pollutant type (air, water, and food); the Delaney clause regarding the carcinogenic potential of additives scientifically interpreted; and newly discovered environmental levels of pollutants compared with past levels. Finally, the wholesale banning of industrial chemicals, including pesticides, must be avoided.

72-0253. MacIver, D. R. (The Pyrethrum Bureau, Nakuru, Kenya). **Synthetic pyrethrins.** *Nature 234(5324): 113; 1971.* (3 references)

In a letter to the editor, the author disagrees with the viewpoint of the article "Pyrethrin Prospects" (*Nature 233: 441; 1971.*). On behalf of the pyrethrum industry, we cannot consent to your opinion concerning the "fate", similar to certain natural products, that the pyrethrum industry will suffer. The synthetic products are not necessarily less toxic: at least one synthetic

pyrethroid had high mammalian toxicity. Furthermore, toxicity figures for the synthetics do not distinguish between chemically pure specimens or practical commerical products. With respect to sneezing properties, commercially produced synergists are more indictable than natural pyrethrins. The economics of natural pyrethrins should be improved by the production of high-content pyrethrum plants and the technique of ultra-low volume dispersion by aircraft.

72-0254. Anonymous. **Pesticides: A few loopholes.** *Nature 234(5325): 121; 1971.*

A bill recently passed by the House of Representatives requires that pesticides be registered with the Environmental Protection Agency, which would classify them as either for general use or restricted use. The EPA will have the right to inspect manufacturing facilities and also the power to bring court injunctions or criminal charges against violators, impose civil penalities, and seize unlawful products. Controls on the manufacture and use of pesticides would be enforced by the states. Environmentalists claim that the bill contains several important loopholes for manufacturers: (1) the most toxic pesticides, instead of being classified for use by permit only, come under the less rigorous controls imposed on the restricted use category; (2) manufacturers will receive federal compensation in the event that a pesticide's registration is cancelled; and (3) provisions for scientific review by committees of the National Academy of Sciences could be used by manufacturers to hold up proceedings.

72-0255. Verbeek, M. M. (Coronel Laboratorium voor Arbeidshygiene Universiteit van Amsterdam, Netherlands.) **Chemische Mutagenen, een gevaar voor de bevolking? [Do chemical mutagens constitute a danger to the population?]** *Tijdschrift soc. Geneesk.* (1 reference) (Dutch)

The mutagenic hazards to man from insecticides or pesticides such as methyl mercury and maleic hydrazide are discussed. The main danger from such compounds resides in the fact that man is often subjected to chronic exposure of substances whose noxious effects have not yet been explored. Thorough research as to multilateral effects of compounds utilized on a large scale and affecting the environment is recommended.

72-0256. Oloffs, P. C.; Szeto, S. Y.; Webster, J. M. (Dept. of Biological Sciences, Simon Fraser University, Burnaby 2, British Columbia, Canada). **Translocation of the organochlorine pesticide residues from soils into carrots.** *Can. J. Plant Sci. 51(6): 547-550; 1971.* (9 references)

Chlorinated hydrocarbon insecticides had been used in the carrot fields of Fraser Valley in British Columbia. A study was performed to analyze the effect of the insecticide on the soil and its possible transference into the carrot. Gas-liquid chromatography was used to test for DDT, DDE, aldrin, dieldrin, heptachlor, heptachlor epoxide, and lindane. The concentration of the insecticide was greater in the muck soil than in the sandy soil, but there was no indication that the carrots grown in the muck had been affected by the residue since much soil lowers the biological activity of the pesticides. It was also apparent that the translocation of lindane into the carrot was at a greater speed than that of cyclodienes or DDT.

72-0257. Cliath, M. M.; Spencer, W. F. (Southwest Branch, Soil and Water Conservation Research Division, ARS, USDA, P.O. Box 112, Riverside, CA 92502). **Movement and persistence of dieldrin and lindane in soil as influenced by placement and irrigation.** *Soil Sci. Soc. Amer. Proc. 35(5): 791-795; 1971.* (16 references)

The redistribution, movement, and volatilization of lindane and dieldrin were studied in the Southwestern Irrigation Field Sta., Brawley, California. The insecticides were evenly distributed in two types of soil: Holtville fine sandy and Imperial silty clay. Within the 2-year period, dieldrin was found to be unchanged in the dry soil; no significant amount of diffusion or volatilization had taken place in either of the two soils. However, upon irrigation there was a slight loss due to volatilization. Lindane, on the other hand, showed a marked difference. Irrigation of the sandy soil caused a greater movement of lindane, however, after a 2-year period there was a great concentration of lindane at the surface due to the inability to volatilize. The marked difference in loss between dieldrin and lindane was due to the vapor pressure of lindane, which is ten times as that of dieldrin. Lindane was lost through volatilization and degradation. The presence in the soil of gamma-penta-chlorohexene (PCCH), a degradation product of lindane, suggests that this is a major pathway for the elimination of lindane. This study implies that the elimination of pesticides from the atmosphere can be accomplished by the injection of the insecticide into the soil or by keeping the soil as dry as possible.

72-0258. Earnest, R. D.; Benville, Jr., P. E. (Division of River Basin Studies, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, U.S. Department of the Interior, Sacramento, CA 95826). **Correlation of DDT and lipid levels for certain San Francisco Bay fish.** *Pestic. Monit. J. 5(3): 235-241; 1971.* (12 references)

During 1969, residue levels of DDT and its metabolites were determined monthly for eight species of fish and one species of crab collected from two sites in San Francisco Bay. Total residue levels were highest in dwarf and shiner perch and lowest in flatfish and crabs. Lipid concentrations were determined in all animals. Correlation coefficients were calculated for percent lipid versus concentrations of DDE, DDD, DDT, and total DDT (DDE + DDD + DDT). There was a significant correlation (P less than .05) between percent lipid and DDT and its metabolites for white perch, pile perch, and staghorn sculpin; dwarf perch had a negative correlation. (Author abstract)

72-0259. Foehrenbach, J.; Mahmood, G.; Sullivan, D. (New York State Department of Environmental Conservation, Division of Marine and Coastal Resources, Ronkonkoma, NY 11779). **Chlorinated hydrocarbon residues in shellfish (Pelecypoda) from estuaries of Long Island, New York.** *Pestic. Monit. J. 5(3): 242-247; 1971.* (2 references)

Since October 1968, shellfish from ten estuaries in Long Island, N.Y., have been collected on a monthly basis and examined for chlorinated hydrocarbons. This study covers the period up to July 1970. The residues found were DDT, DDD, DDE, and dieldrin; concentrations were low, the highest being 0.146 mg/kg, wet weight. The distribution of residues could at times be correlated with agricultural use to type of community in the watershed surrounding the various stations. (Author abstract)

72-0260. McLane, M. A. R.; Stickel, L. F.; Newsome, J. D. (Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, U.S. Department of the Interior, Laurel, MD 20810). **Organochlorine pesticide residues in woodcock, soils, and earthworms in Louisiana, 1965.** *Pestic. Monit. J. 5(3): 248-250; 1971.* (3 references)

Woodcock (*Philohela minor*), earthworms (*Lumbricidae*), and soil samples were collected from January-March 1965, from fields in southeastern Louisiana approximately three years after discontinuance of areal treatments with heptachlor in this region. Heptachlor epoxide residues in woodcock averaged 0.42 ppm (dry weight), conspicuously lower than in 1961 and 1962. Residues in DDE in woodcock averaged 3.62 ppm, higher than in birds taken in the same area in 1961-62. Earthworms and soils contained traces of several organochlorine pesticides. (Author abstract)

72-0261. Laubscher, J. A.; Dutt, G. R.; Roan, C. C. (Woodson-Tenent Laboratories, 345 Adams, P.O. Box

2135, Memphis, TN 38102.) **Chlorinated insecticide residues in wildlife and soil as a function of distance from application.** *Pestic. Monit. J. 5(3): 251-257; 1971.* (11 references)

DDT and its metabolites were studied in a diverse econosystem downwind from an area of insecticide application. Results showed that the distance from agriculture determines the relative quantities of residues present in animals, birds, and soils. Residues of DDT plus its metabolites were detected at levels from 6 to 929 ppb in Whitefooted mice and from 2.9 to 2770 ppb in various other animals. Samples of quail liver from the study area contained residues ranging from 500 to 2800 ppb, and soil residues ranged from 2.9 to 2770 ppb in various other animals. Samples of quail liver from the study area contained residues ranging from 500 to 2800 ppb, and soil residues ranged from 3.6 to 6700 ppb. Results also showed the DDT residue levels in biological specimens decline as the soil insecticide concentrations decline. (Author abstract)

72-0262. Harris, C. R.; Sans, W. W. (Research Institute, Canada Dept. of Agric., University Sub Post Office, London 72, Ontario, Canada). **Insecticide residues in soils on 16 farms in southwestern Ontario-1964, 1966, and 1969.** *Pestic. Monit. J. 5(3): 259-267; 1971.* (12 references)

A study was conducted on 16 farms in southwestern Ontario during 1964, 1966, and 1969 to determine the extent to which residues of insecticides were accumulating in agricultural soils as a result of current insect control practices. Residues of organochlorine insecticides were determined by gas-liquid chromatography (GLC), while those of the organophosphorous insecticides were determined qualitatively by non-specific enzymatic analysis and quantitatively by GLC where possible. Residues of the organochlorine insecticides were present in soils on all 16 farms in 1964, 1966, and 1969. DDT/DDE/DDD occured on all farms, aldrin/dieldrin on 14 of 16, and heltachlor/heptachlor epoxide/*gamma*-chlordane on six farms. Other organochlorine insecticides detected included dicofol in orchards, endrin, trace amounts of lindane, and endosulfan. Highest average residue levels of the organochlorine insecticides were present in orchard, vegetable, tobacco, and field crop soils; the orchard contained the greatest amount of residue and the field crop the least amount. The use pattern indicated that the organochlorine insecticides were used almost exclusively between 1961 and 1964, but that the organophosphorous insecticides received increased use from 1965-1969. Residues of the organochlorine insecticides in soil appeared to be consistent with the use pattern in that they were highest in 1966 and declined by 1969 to levels similar to those found in 1964. Preliminary data indicated that the trend to extensive use of the organophosphorous insecticides is resulting in the presence of residues of some of these materials in vegetable soils. (Author abstract)

72-0263. Mullins, D. E.; Johnsen, R. E.; Starr, R. I. (Department of Entomology, Virginia Polytechnic Institute, Blacksburg, VA 24060). **Persistence of organochlorine insecticide residues in agricultural soils of Colorado.** *Pestic. Monit. J. 5(3): 268-271; 1971.* (9 references)

An exploratory study of the presence and persistence of organochlorine insecticide residues in soils of Colorado was conducted. Fifty samples of orchard and cultivated soils were collected during the summer of 1967 and analyzed in 1968. A new ultrasonic extraction technique was utilized, and analyses were done using electron-capture gas chromatography and thin-layer chromatography. DDT was detected in 27 of the 50 soils sampled and ranged in concentrations from 0.06 to 41.10 ppm. Aldrin and/or dieldrin residues were detected in 14 of 50 samples, ranging from less than 0.02 to 0.91 ppm. Heptachlor and/or its epoxide were found in 11 of the soils sampled at concentrations of less than 0.02 to 0.07 ppm. *Gamma*-chlordane was found in eight of these 50 samples at concentrations of less than 0.02 to 0.05 ppm. Other materials detected in these 50 soils were: lindane, in eight samples, dicofol in seven, endrin in two, endosulfan in one, and toxaphene in one. Residues of organochlorine insecticides were not detected in nine of the samples analyzed. The overall organochlorine concentrations in the soils sampled were lower than those reported by workers in other regions. (Author abstract)

72-0264. Ware, G. W.; Estesen, B. J.; Cahill, W. P. (Dept. of Entomology, The University of Arizona, Tuscon, AZ 85721). **DDT moratorium in Arizona-Agricultural residues after two years.** *Pestic. Monit. J. 5(3): 276-280; 1971.* (5 references)

The 1969 and 1970 moratorium on agricultural use of DDT in Arizona has been very effective. Green alfalfa residues declined significantly in these two years, to a probable plateau of 0.05 ppm. Beef fat residues also dropped correspondingly in 1970 to one-half the level found in 1969. DDTR soil residues have changed almost negligibly, suggesting a half-life in excess of 10-12 years. These residues are now primarily DDE, indicating that any future problems during the DDT moratorium will be attributed to this "universal contaminant," rather than to the parent DDT. (Author abstract)

72-0265. Kolipinski, M. C.; Higer, A. L.; Yates, M. L. (Water Resources Division, Geological Survey, U.S. Dept. of the Interior, 51 S.W. 1st Ave., Miami, FL

33130). **Organochlorine insecticide residues in Everglades National Park and Loxahatchee National Wildlife Refuge, Florida.** *Pestic. Monit. J. 5(3): 281-8; 1971.* (22 references)

The Water Resources Division of the U.S. Geological Survey has established field programs for monitoring environmental concentrations of selected organochlorine insecticides in the Everglades of south Florida. Water in Everglades National Park and Loxahatchee National Wildlife Refuge contained DDT and its metabolites DDD and DDE in the range 0.000 to 0.03 *mu*g/liter. Some samples of soils underlying marshes had concentrations of the DDT family as much as three orders of magnitude greater than the concentrations found in water. Algal mats, omnivorous marsh-dwelling crustaceans, and marsh fishes, showed concentrations of the DDT and its metabolites were found more frequently than other organochlorine insecticides in the materials examined. Residues found in Everglades National Park and Loxahatchee National Wildlife Refuge come from transport mechanisms such as surface water inflow and aerial transport, the latter consisting of direct particulate fallout and precipitation. Work is continuing to determine sources, distribution, and fate of organochlorine and other pesticide types of south Florida. (Author abstract)

72-0266. Miles, J. R. W.; Harris, C. R. (Research Institute, Canada Dept. of Agric., University Sub Post Office, London 72, Ontario, Canada). **Insecticide residues in a stream and a controlled drainage system in agricultural areas of southwestern Ontario, 1970.** *Pestic. Monit. J. 5(3): 289-294; 1971.* (13 references)

A creek flowing into Lake Erie and a controlled drainage system (the water of which is pumped into Lake Erie) were monitored for insecticide residues during 1970. Big Creek, located in Norfolk County, Ontario, drains an area of 280 square miles, chiefly tobacco farms. *P,p'*-DDE, *o,p'*-DDT, *p,p'*-DDD, *p,p'*-DDT, and dieldrin were determined in water, bottom mud, and fish. The greatest concentration of DDT was 67 parts per trillion in the water, 441 parts per billion in the mud, and 1.0 ppm in the fish. There appeared to be a corrolation between rainfall and the concentration of insecticide in the creek water. In 1970, the total amount of organochlorine insecticides that passed from this creek into Lake Erie per week averaged 0.11 lb. The drainage system, near Erieau, Ontario, drained about 1500 acres of muck land used for growing vegetables. Concentrations of insecticides in the drainage system were greater than those in Big Creek, but the transfer of insecticides into Lake Erie was much less from the drainage system. (Author abstract)

72-0267. Wallace, J. B.; Brady, U. E. (University of Georgia, College of Agric., Experiment Station, Athens, GA 30601). **Residue levels of dieldrin in aquatic invertebrates and effect of prolonged exposure on populations.** *Pestic. Monit. J. 5(3): 295-300; 1971.* (18 references)

A woolen mill that uses dieldrin as a mothproofing agent releases 0.2 ppm in the plant's effluent, which in turn empties into a small Piedmont river in South Carolina. The number of species of aquatic invertebrates downstream in this river has been greatly reduced, and population complexes have been altered. In all cases, dieldrin levels in extracts of specimens were higher downstream from the plant's effluent outfall than upstream. In some cases dieldrin residues in the downstream fauna were higher by a thousandfold than levels in the upstream counterparts. Downstream, the dieldrin residue, based on wet weights, was as high as 24 ppm in *Simulium vittatum* Zett. larvae (Diptera: *Simuliidae*); 23 ppm in *Hydropsyche* sp. and 103 ppm in *Cheumatopsyche* sp. larvae (*Trichoptera*: *Hydropsychidae*); and 62 ppm in snails *Physa* sp.). (Author abstract)

72-0268. Zabik, M. J.; Pape, B. E.; Bedford, J. W. (Dept of Entomology and Institute of Water Research, Michigan State University, East Lansing, MI 48823). **Effect of urban and agricultural pesticide use on residue levels in the Red Cedar River.** *Pestic. Monit. J. 5(3): 301-308; 1971.* (3 references)

Analyses on 1549 water and bottom samples have shown high levels of DDT and its metabolites (TDE and DDE) in the Red Cedar River. The river becomes progressively contaminated in a downstream direction and shows seasonal variations. The concentration of pesticides in bottom samples give a good indication of long term contamination, whereas levels in the suspended matter (that retained by a 5-*mu* filter) indicate the amount of pesticide being carried on a short term basis. Results of this study have shown that the largest amount of pesticide contamination entering the Red Cedar River comes from the waste water treatment plants. (Author abstract)

72-0269. Castro, T. F.; Yoshida, T. (Dept. of Soil Microbiology, The International Rice Institute, Los Banos, Laguna, Philippines). **Degradation of organochlorine insecticides in flooded soils in the Philippines.** *J. Agr. Food Chem. 19(6): 1168-1170; 1971.* (16 references)

The degradation of the organochlorine insecticides DDT, DDD, methoxychlor, heptachlor, chlordane,

endrin, dieldrin, and aldrin was investigated under upland and flooded conditions. DDT, DDD, methoxychlor, and heptachlor degraded faster in flooded soil and were found to degrade faster in soils with high organic matter content. DDD was found to accumulate in DDT-treated flooded soil. Endrin was degraded only in Casiguran flooded soil. Aldrin was more persistent in flooded than in upland soil. Chlordane and dieldrin were persistent both in flooded and in upland soil. (Author abstract reprinted by permission of the American Chemical Society.)

72-0270. Crosby, D. G.; Hamadmad, N. (Dept. of Environmental Toxicology, Univ. of California, Davis, CA 95616). **The photoreduction of pentachlorobenzenes.** *J. Agr. Food Chem. 19(6): 1171-1174; 1971.* (20 references)

Ultraviolet (2537 A) irradiation of the fungicides pentachloronitrobenzene (PCNB), pentachlorobenzene (PCB), pentachlorophenol (PCP) in organic solvents resulted primarily in reductive chlorination. The nitro group in PCNB was removed to form PCB, but corresponding nitroanilines were not detected. Reduction occurred ortho and meta to the electron-withdrawing substituent, para to the electron-releasing group, and in para and meta positions where the substituent was H, indicative of either a free radical or hydride transfer mechanism. The compounds remained almost unchanged in sunlight, probably excluding photolysis as a major route of environmental loss. (Author abstract reprinted by permission of the American Chemical Society)

72-0271 Westlake, W. E.; Dusch, M. E.; Gunther, F. A.; Jeppson, L. R. (Dept of Entomology, Citrus Research Center and Agricultural Experiment Station, Univ. of California, Riverside, CA 92502). **Persistence of O,O-diethyl S-(2-chloro-1-phthalimidoethyl) phosphorodithioate (Torak) on and in lemons, oranges, and dried citrus pulp cattle feed, and toxicity of the residues to mites.** *J. Agr. Food Chem. 19(6): 1191-1195; 1971.* (3 references)

Residues of Torak were determined on and in Valencia oranges, Eureka lemons, and citrus pulp cattle feed prepared from treated oranges. The residue half-lives were 40-60 days on oranges and 60-80 days for lemons. Concentrate spray applications gave higher initial deposits and somewhat longer residue half-lives than did full volume sprays. The difference in deposits may be due in part, at least, to the sampling technique used. There was a rapid penetration of the pesticide into the rind but none into the peeled fruit. Washing was ineffective in removing Torak residues. There was no evidence of the presence of the oxygen analog, a potential metabolite. Bioassay evaluations were made at each sampling interval to establish the effect to type of application and kind of fruit on toxicity to mites. Low volume applications were effective longer than the dilute applications, and residues were effective for a longer period on oranges than on lemons. (Author abstract reprinted by permission of the American Chemical Society)

72-0272. Kleinschmidt, M. G. (Dept. of Agricultural Chemistry, Washington State University, Pullman, WA 99163). **Fate of Di-syston O,O-diethyl S-2-(ethylthio) ethyl phosphorodithioate in potatoes during processing.** *J. Agr. Food Chem. 19(6): 1196-1197; 1971.* (6 references)

Total residues of Di-syston (disulfoton) were reduced by 35% by lye peeling. Lye peeling plus the first water blanching reduced the total residue on a dry weight basis by 58, 74, and 61% for french fries, dehydrated cubes, and dehydrated mashed, respectively. When expressed on a dry weight basis, dehydration caused a further reduction in total residue. Apparent increases in oil cooking french fries were attributed to a dehydration effect. On a dry weight basis overall reduction in residues due to processing potatoes into french fries, dehydrated cubes, dehydrated mashes, and chips were 77, 91, 89, and 97% respectively. (Author abstract reprinted by permission of the American Chemical Society)

72-0273. Isensee, A. R.; Jones, G. E. (Plant Science Research Division, Agricultural Research Service, U.S. Dept. of Agricultural, Beltsville, MD 20705). **Absorption and translocation of root and foliage applied 2,4-dichlorophenol, 2,7-dichlorodibenzo-p-dioxin, and 2,3,7,8-tetrachlorodibenxo-p-dioxin.** *J. Agr. Food Chem. 19(6): 1210-1214; 1971.* (3 references)

Uptake of 14-C-labeled 2,4-dichlorophenol (DCP), 2,7-dichlorodibenzo-p-dioxin (DCDD), and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) from nutrient solution, soil, and foliage by oats and soybeans was measured. Solutions and soils were treated with, respectively, 0.20 and 0.07 ppm of DCP, 0.26 and 0.10 ppm of DCDD, and 0.18 and 0.06 ppm of TCDD. After 14 days uptake from solution, seedling oats and soybeans contained (minus control) 1.84 and 0.13 ppm of DCP, 0.16 and 0.01 ppm of DCDD, and 0.11 and 0.01 ppm of TCDD, respectively. After growing to maturity in soil, oats and soybeans contained (minus control) 0.010 and 0.020 ppm of DCP, 0.020 and less than 0.001 ppm of DCDD, and less than 0.001 and less than 0.001. ppm of TCDD, respectively. Accumulation of TCDD by plants from soil was concluded to be highly unlikely. No translocation of the foliar-applied DCP, DCDD, or TCDD was measured. More TCDD was removed by simulated rainfall two hr after application (50 to 60%) than after seven days (26% oats and 2% soybeans). (Author abstract reprinted by permission of the American Chemical Society)

72-0274. Bowman, M. C.; Leuck, D. B. (Entomology Research Division, Agricultural Research Service, U.S. Dept. of Agriculture, Tifton, GA 31794). **Determination and persistence of phoxim and its oxygen analog in forage corn and grass.** *J. Agr. Food Chem. 19(6): 1215-1218; 1971.* (10 references)

Residues of the insecticide phoxim (Phenylglyoxylonitrile oxime O,O-diethyl phosphorothioate; Bay 77488) and its oxygen analog were determined in Coastal bermudagrass, *Cynodon dactylon* (L.) Pers., and corn after the insecticide was applied in the field as aqueous sprays of an emulsifiable concentrate at rates of 6, 12, and 24 oz (active ingredient) per acre. Also, glass jar (qt) silage was made from 1-day posttreatment corn. Recoveries of phoxim and its oxygen analog from spiked samples by the method used were about 96 and 65%, respectively; sensitivity was about 0.004 ppm. Phoxim diminishes rapidly and was not detectable at 21 days posttreatment in either forage, no matter what the rate of application. Residues of the oxygen analog were detected at zero-day posttreatment only. In corn silage, the residues of phoxim (the oxygen analog was not detected) were not stable. (Author abstract reprinted by permission of the American Chemical Society)

72-0275. Montgomery, M. L.; Chang, Y.-L.; Freed, V. H. (Dept of Agricultural Chemistry, Oregon State University, Corvallis, OR. 97331). **Comparative metabolism of 2,4-D by bean and corn plants.** *J. Agr. Food Chem. 19(6): 1219-1221; 1971.* (14 references)

Three routes of metabolism of 2,4-D were demonstrated in resistant and susceptible plants. These pathways are simple conjugation, conjugation and hydroxylation, and oxidation of the side chain. In the process of hydroxylation the chlorine atom in the 4 position is shifted to the 3 or 5 position. The primary shift is to the 5 position so that major metabolic residue is 4-hydroxy-2,5-dichlorophenoxyacetic acid with lesser amounts of 4-hydroxy-2,3-dichlorophenoxyacetic acid being formed. Only very small amounts of 2,4-D are detoxified through oxidation of the side chain. Essentially all of the absorbed 2,4-D is rapidly conjugated in corn bluegrass. In beans the conjugation is much slower, with free 2,4-D being present at each of the harvest times. These findings strongly indicate that inactivation through conjugation is an important factor in selectivity. (Author abstract reprinted by permission of the American Chemical Society)

72-0276. Misra, S. S.; Verma, S.; Handa, S. K.; and Lal, R. (Indian Agricultural Research Inst., New Delhi, India). **BHC and parathion residues on crop of yellow-sarson (*Brassica campestris* L. var. *sarson* Prain.)** *Indian J. Agr. Sci. 41(3):276-279; 1971.* (8 references)

Benzene hexachloride (BHC) dust and parathion emulsion were applied to Yellow-sarson (*Brassica campestris* L. var. *sarson* Prain) and tested from the viewpoint of consumer safety. Application was in accordance with the schedule recommended for protecting the mustard crop from the mustard saw-fly and the mustard aphid. The crop was dusted one month after sowing with five percent BHC dust at 20 kg/ha and subsequently sprayed twice at 25-day intervals with 0.05 and 0.1% parathion emulsion at 900 liters/ha. Plant deposits and residues were estimated at different intervals. One hour after treatment BHC dust deposits on leaves and tender stems were 11.68-12.82 ppm, with an average of 12.15 ppm but residues were well below the 5-ppm tolerance limit by the third day. Parathion residue in flowers and green pods was below the 1-ppm tolerance limit 11 days after treatment. In mature crushed grain, residues were below the detectable level (0.1 ppm) 20 days after the last spray application.

72-0277. Bixby, M. W.; Boush, G. M.; Matsumura, F. (Dept of Entomology, U. of Wisconsin, Madison, WI). **Degradation of dieldrin to carbon dioxide by a soil fungus *Trichoderma koningi*.** *Bull. Environ. Contam. Toxicol. 6(6): 491-494; 1971.* (9 references)

Cultures of the fungus *Trichoderma koningi* were labeled with (14-C)dieldrin and (14-C)UL-glucose at all chlorine-attached carbons and studied for (14-C)carbon dioxide evolution. The average radioactivity given off from the (14-C)dieldrin substrate was 3.1%, and the average radioactivity evolved from the (14-C)UL-glucose was 48.0%. No (14-C)carbon dioxide evolved from control tubes containing (14-C)dieldrin and culture medium but no fungus. These results indicate that *T. koningi* is capable of degrading one more of the carbons on the chlorinated ring of the dieldrin molecule. The amount of radioactivity remaining in the spent medium with the (14-C)dieldrin isotope was approximately 15%. It is probable that the radioactivity unaccounted for was contained within the mycelium.

72-0278. Johnson, L. G.; Morris, R. L. (State Hygienic Laboratory, University of Iowa, Iowa City, IA 52240). **Pesticide and mercury levels in migrating duck populations.** *Bull. Environ. Contam. Toxicol. 6(6): 513-516; 1971.* (3 references)

The extent of pesticide and mercury contamination in the migratory ducks in Iowa was studied. The guideline used for maximum permissible concentration of both pesticides and mercury was the one established by the Food and Drug Administration for the edible portion of fish. Breast muscle, liver, and fat of the mallard ducks were examined and except for two values of mercury in the liver the results did not show significant amount of contamination when compared with the findings of the Food and Drug Administration for fish.

72-0279. Ware, G. W.; Rakickas, M. E.; Cahill, W. P. (Dept. of Entomology, U. of Arizona, Tuscon, AZ). **Differences in DDTR residues in green alfalfa, hay, and cubes from the same source.** *Bull. Environ. Contam. Toxicol. 6(6): 517-520; 1971.* (4 references)

A study was conducted to determine why samples of alfalfa hay and hay cubes collected from the same DDT-sprayed fields exhibited differences in DDTR residues. Window hay, green standing alfalfa, and cube samples were collected from four fields with varying DDT use rates. The green alfalfa samples were extracted with hexane:methanol and the cubes and hay with chloroform:methanol. All extracts were dehydrochlorinated with ethanolic sodium hydroxide to produce dichlorodiphenyldichloroethylene (DDE), washed, and dried by passing through anhydrous sodium sulfate. Analysis for *p,p'*- and *o,p'*-DDE was by electron-capture gas chromatography. In all four studies, cube residues were generally 63% higher than those in the windrow hay from which the cubes were derived. Theoretically, all values within a sampling should have been the same. The discrepancies appeared to be related to drying rate and cellular disruption. The cubing process must alter residue status in dry alfalfa through sudden heat increase, resulting from the friction of compression, or cellular disruption, making cell contents more accessible to the water used to facilitate cubing.

72-0280. Dyment, P. G.; Hebertson, L. M.; Gomes, E. D.; Wiseman, J. S.; Hornabrook, R. W. (Pediatric Service, William Beaumont General Hospital, El Paso, TX 79920). **Absence of polychlorinated biphenyls in human milk and serum from Texas and human milk from New Guinea.** *Bull Environ. Contam. Toxicol. 6(6): 532-534; 1971.* (6 references)

Forty-seven lactating women from Texas and 32 from New Guinea had their breast milk assayed for the presence of polychlorinated biphenyls (PCBs). Twenty-eight of the Texas women also had serum samples assayed for PCBs. Despite the presence of chlorinated hydrocarbon insecticides in all Texas samples, no PCBs were detected in either milk or serum. Similarly, no PCBs were detected in the New Guinea milk samples, although DDT and DDE were present in all but one sample. Because PCBs are lipid soluble, they should be recoverable from lipid-containing tissue such as milk or serum. Their total absence from these samples suggest that PCBs are not yet significantly contaminating humans.

72-0281. Stull, J. W.; Brown, W. H.; Whiting, F. M. (Dept. of Dairy and Food Sciences, the University of Arizona, Tuscon, AZ). **Correlation between pesticide levels in milk and carcasses of dairy cows.** *Bull. Environ. Contam. Toxicol. 6(6): 568-569; 1971.* (8 references)

According to experimental study, there is a fairly close correlation between the concentration of pesticide found in milk fat and that in the carcass of the lactating cow. Pesticide contamination in the carcass of the dairy cow can be simply detected by measuring the amount of pesticide contamination in the milk, since milk is the primary excretory route of chlorinated hydrocarbon pesticides such as DDT. Unsuspected herd contamination can be prevented by use of this information.

72-0282. Chow, C.; Montgomery, M. L.; Yu, T. C. (Dept. of Agricultural Chemistry, Oregon State U., Corvallis, OR 97331). **Methodology and analysis for residues of MCP and 2,4,5-T in wheat.** *Bull. Environ. Contam. Toxicol. 6(6): 576-580; 1971.* (6 references)

The ability of the herbicides 2-methyl-4-chlorophenoxyacetic acid (MCP) and 2,4,5-T to form conjugates in wheat was confirmed by thin-layer chromatographic analysis of alcohol and ether extracts of surface residues on silica gel plates. The rate of conjugation of MCP was greater than for 2,4,5-T so that at the end of two weeks nearly all the MCP was present as conjugate, while 40% of the 2,4,5-T was in a bound form. To measure total herbicide residues, a method for combined extraction and hydrolysis of such conjugates was developed. The method involves heating a mixture of macerated plant tissue and sodium hydroxide on a steam bath, filtering the mixture, and washing the filter cake with water. Combined filtrates are acidified to at least pH 1 with dilute sulfuric acid and extracted with ether. Sufficient sulfuric acid is added to the extracted aqueous phase to give a 2M acid concentration. The acidic mixture is then heated on a steam bath and re-extracted with ether. The alkaline extraction hydrolyzes the conjugates without additional acid treatment since no detectable MCP is found following acid hydrolysis. Application of this method to wheat treated with MCP and 2,4,5-T in the tillering stage showed appreciable concentrations of both chemicals shortly after application. However, weathering, growth dilution, and metabolism reduced the chemicals to undetectable levels in the grain by 56 days.

72-0283. Zerbe, J.; Nowaczyk, W.; (Poznan, Poland) **Przetwarzanie surowcow rolno-spozywczych a zawartosc pozostalosci pestycydow z grupy weglowodorow chlorowanych. [The processing of agricultural nutrients and the content of the residue of pesticides from the group of chlorinated hydrocarbons.]** *Przem. Spozy. 25(8): 285-288; 1971.* (37 references) (Polish)

On account of the world-wide use of pesticides, the human body has absorbed great quantities of chlorinated hydrocarbons. The universal appearance of these residues in humans is also the result of the long-life of DDT and similar chemical compounds. This problem has attracted wide attention and became the subject

matter of many studies. The authors wish to acquaint the readers with some of the methods used in eliminating the residual pesticides from farm-based foodstuffs and especially in eliminating insecticides belonging to chlorinated hydrocarbons. They described various tests performed by different researchers which involved attempts to eliminate DDT residues during the processing of various fruits, vegetables, dairy products, and a variety of other products, such as vegetable oil, soyabean oil, cotton oil, veal, chicken, flour, and rice. In conclusion, they again stress the importance of all these various methods for the preservation of the health of the world's population.

72-0284. Hascoet, M. (Laboratory for Plant Pharmacy, INRA, Versailles, France). **Les residues de pesticides dans les produits laitiers. [Pesticide residues in dairy products.]** *Rev. Med. Vet. 34(8-9): 821-843; 1971.* (44 references) (French)

General causes of dairy product contamination with organochlorine pesticides are analyzed. The deep concern caused by these compounds is due to their wide use in feed protection (soil treatment) stable disinfection and veterinary treatment. The danger of these compounds contaminating the dairy products is due to their chemical stability and to their lipophilic nature as opposed to the organophosphorus or carbamate derivatives. BHC constitutes the main dairy product pollutant in France contrary to other countries where DDT is the main subject of concern. BHC had been found to be present in all the butter samples analyzed in 1968 (0.01 ppm lower detection limit) while dieldrin, heptachlor epoxide and DDT were found in 88, 62, and 60% of the analyzed samples respectively. BHC had been the leading soil pesticide applied in France for the last 10 yr. BHC contamination varies according to sampling season and region as well as with the animal breeding and raising technology. In spring BHC concentrations vary from 0.5 to 1.0 ppm; in fall, these concentrations are affected mainly by the animal raising factor. These values decrease to 0.1 below that in winter after the animals had spent a whole summer outdoors on free pasture, which points out the role of the stable disinfection factor in enhancing BHC contamination. Organochlorine pesticides occupy the following decreasing order according to their contaminating potentiality: heptachlor epoxide, dieldrin and aldrin, endrin, *gamma*-BHC, heptachlor, methoxychlor; this order coincides with their lipophilic properties as well. The necessity of a tight collaboration between research and legislation in order to provide the consumer with safe daily products is emphasized.

72-0285. Bovey, R. W.; Scifres, C. J. (Texas Agricultural and Mechanical U., Texas Agricultural Experiment Station College Station, TX 77843) **Residual characteristics of picloram in grassland ecosystems.** *Texas Agr. Exp. Sta. Bull. 1111, July 1971, 24 p.* (66 references)

Picloram (4-amino-3,5,6-trichloropicolinic acid) applied alone or in combination with 2,4,5-trichlorphenoxyacetic acid (2,4,5-T) has potential for control of many herbaceous weeds and wood plants in grasslands. New data on rates and routes of picloram dissipation are reported for Texas grasslands. Picloram is susceptible to photodecomposition and is mobile within the ecosystem, following the movement of water. Movement of picloram over the soil surface is governed primarily by intensity of rainfall, time-lapse from application to the first rain, rate of picloram applied, density and botanical composition of vegetation cover, soil texture, and slope of the land. In North Texas, 17 ppb of picloram occurred in surface runoff after application of 0.25 pound/acre to highly permeable, sparsely vegetated soils. Applications of one and two pounds/acre to rangeland in South and Southwest Texas did not result in detectable residues in domestic water wells. Dilution in soil may be one of the most important, practical means of dissipating picloram. Vegetative growth of sensitive field crops would probably not be reduced by a single irrigation of water containing 1-4 ppb of picloram. Large columes of water containing 4 ppb applied to seedlings would likely reduce crop growth, while residues of 10 ppb or more in irrigation water could severely affect the growth of some sensitive crop seedlings. Picloram residues in the environment do not appear harmful to mammals, fish, birds, or insects.

72-0286. Schneider, A. D.; Weise, A. F.; Jones, O. R.; Mathers, A. C. (Texas Agriculture and Mechanical U., Texas Agriculture Experiment Station, College Station, TX 77843) **Determining the fate of herbicides in the Orgallala aquifer.** *Texas Agr. Exp. Sta. Bull. 1112, Aug. 1971, 15p.* (9 references)

Pollution hazards created by recharging playa water to a sand aquifer through a dual-purpose well were studied by adding 0.125 ppm picloram, 1.28 ppm atrazine, and 0.024 ppm trifluralin to recharge water and following the movement of the herbicides through the aquifer. Sodium nitrate was also added as a tracer. Recharge continued for 10 days at an average rate of 360 gal/min. The chemicals were injected continuously into the recharge water. Each of the herbicides was detected in observation wells 30 and 66 ft from the dual-purpose well, herbicide and nitrate concentrations in the first observation well reaching the injection concentration in 56-120 hrs. In the second observation well, chemical concentrations were the same as in injected water after 10 days of recharging. No herbicide or nitrate was detected in an observation well 160 ft from the dual-purpose well. Essentially all the herbicides were recovered after a 10-day pause by pumping one and two-thirds times the volume of recharged water. Thus a

dual-purpose well in a sand aquifer accidentally contaminated by pesticides will not be a serious hazard if the well is pumped soon after recharging. The allowable pause will depend on local conditions such as permeability, porosity, and regional ground-water gradient. Water from a contaminated well could be used to irrigate a tolerant crop.

72-0287. Zamfir, Gh.; Simona, A.; Filipiuc, M.; Aléxa, L.; Melinte, C.; Gevat, V. (Inst. of Hygiene, Iasi, Rumania). **Die Wirkung gewisser organo-chlorierter Pestizide auf die hygienisch-sanitaeren Indikatoren des Wassers. [The action of certain chlorinated organic pesticides on the hygienic and sanitary parameters of water.]** *Z. Gesamte Hyg. 17(10): 734-740; 1971.* (11 references) (German)

The dynamics of water self-purifying parameters as affected by small amounts of Detox (DDT, 25% active substance) and Lindatox (with 20% gamma-isomer of BHC Lindane, as the active substance) were investigated. Each compound was applied at doses of 0.02, 0.2 and 2 mg/L (active substance) and, additionally, a mixture of the two compounds (1:1) in similar concentrations was used to study their combined effects. The experiment lasted 20 days. Permanganate consumption, dissolved oxygen and plankton growth dynamics are graphically reproduced. Both pesticides induced an increase of oxidability and of the 5 day-biochemical oxygen consumption index indicating enhanced plankton growth towards the end of the experiment. Intensified development of algae after a 5-10 day inhibitory effect and stimulation of the bacterial flora (37°C) reached peak values with 2 mg/L doses in both individual and mixed compound tests. None of the compounds produced increased bacterial development when used at a 0.02 mg/L dose. No differences in pH values or nitrogen compound levels were induced under the experimental conditions. The toxicity of DDT (0.02 mg/L) to *Daphnia* appeared to be almost 4 times that of lindane. Germination tests with *sinapis* and *cannabis* seeds showed DDT to be more toxic than lindane during the first days of the experiment. Lowest admissible standards for DDT (below 0.02 mg/L, and its eventual prohibition are discussed.

72-0288. Truhaut, R. (Toxicology Research Center, Dept. of Pharmaceutical and Biological Sciences of the Rene Descartes University, Paris, France). **Le probleme des limites admissibles pour les polluants de L'air. [The problem of maximum allowable concentrations of air pollutants.]** *Prod. Probl. Pharm. 26(8): 530-548; 1971.* (47 references) (French)

The concept of maximum allowable concentration (MAC) of toxic substances in the occupational environment and its application to community air pollution are discussed. The complexity of this concept due to different analytical techniques applied in this field of toxicology, and because of the instability of certain compounds, as well as to divergent interpretations made to the same kind of information, is analyzed. These problems are illustrated by comparing maximum allowable concentrations of noxious compounds which had been established by the industrial hygiene authorities in the USA with those established in the Soviet Union. Pesticides such as chlordane, lindane, heptachlor, and malathion were included on the list. The MAC values were 0.5, 0.5, 0.5 and 15 mg/cubic meter, respectively as established in the USA and 0.01, 0.05, 0.01 and 0.5 mg/cubic meter respectively as reported by the USSR. The need for active international cooperation in studies for the establishment of toxicological thresholds and of MAC values for air pollutants is emphasized.

72-0289. Peyron, L. (Lautier Fils, Grasse, France). **Les pesticides dans les produits naturels odorants. [Pesticides in fragrant natural products.]** *Parfum. Cosmet. Savons France 1(9): 467-478; 1971.* (24 references) (French)

Lindane was applied to lavender, diethion (ethion) was applied to rose, violet, bitter orange and pink carnation, dimethoate was applied to bitter orange and pink carnation, malathion was applied to bitter orange and parathion was applied to rose, violet, bitter orange and pink carnation cultures to investigate their impact on the smell properties of the processed essence products and to trace their eventual residues. Aldicarb, maneb and thiram were applied to rose, pink carnation and violet cultures to investigate residual traces from sulfur containing pesticides. Flame photometry appeared to be the most appropriate method for the detection of these compounds. Analytical methods including thin-layer chromatography and gas chromatography are described. Lindane and temik produced no olfactory effects. Diethion, metasystemox (methyl demeton) and ethyl thiourea produced certain olfactory shades and their presence was confirmed by TLC. More information on the utilization of pesticides in the world of fragrance plants is needed to prevent the problem of their residual occurrences. Plant growers should be made aware of the importance of choice and staging of pesticide application in order to provide appropriate raw materials for the perfume industry.

72-0290. Niehuss M; Boerner, H. (Inst. for Phytopathology, Christian-Albrechts Univ., Kiel, Germany) **Persistenz und Verteilung von Diuron, Dichlobenil, Dalapon und . Paraquat nach einsatz in Entwaesseurngsgraeben. [Persistence and distribution of diuron, dichlobenil, diuron and paraquat following application in drainage ditches.]** *Pflanzenkrankheit. und Pflanzenschutz 78(7): 385-397; 1971.* (10 references) (German)

Persistance and distribution of diuron, dalapon, dichlobenil and paraquat utilized for chemical control of weeds in drainage ditches were investigated. A sketch of the treated area is reproduced. Samples of water, sludge and soil (the latter from 0-5 cm, 5-10 cm and 10-20 cm. layers) were taken for analytical determinations. A decrease of herbicide levels to 10-20% of their initial content in water was found to occur within 10 days following application. This decrease was attributed to several factors such as decomposition, dilution adsorption by the sludge or soil components or to the pumping operations. No penetration of herbicides into the deeper soil layers could be observed. The pesistence of these compounds in the upper soil layer was found to last approximately one month and was attributed to its close contract with the water phase. However, no traces of any of these compounds were detected in this layer within three months following application. The bulk of the herbicides appeared to be concentrated in the sludge matter.

72-0291. Malkomes, H. P. (Inst. for Plant Protection and Disease, Technological University Hannover, Germany) **Untersuchung verschiedener Einfluesse auf die Zersetzung von Methylbromid (TERABOL) bie Begasung von Boden und Pflanzsubstraten. [A study of various factors acting upon the decomposition of methyl bromide (TERABOL) following fumigation of soil and plant substrates.]** *Z. Pflanzenkraknheit. und Pflanzenschutz 78(8): 464-476; 1971.* (38 references) (German)

Peat, perlite and different varieties of soil samples with various moisture contents were subjected to fumigation with methyl bromide at 10° and 20°C to study the effect of sample texture, moisture, temperature, herbicide doses and duration of its application upon its conversion into bromide residues. Bromides were determined using phenol red as an indicator. Higher doses of gaseous herbicide applied at 20°C produced larger amounts of residual bromides. Moisture inhibited the conversion of the herbicide in the peat samples. Increased amounts of organic matter, contained in some of the samples, enhanced the formation of bromides. Conversion of methyl bromide in light soils was promoted under dry conditions; heavy soils promoted this process under wet conditions. Liquid methyl bromide produced no increased bromide yields in perlite, styromull or hygromull. However, larger amounts of bromide were produced in both moist and dry soil and peat samples when liquid methyl bromide was utilized as compared to gaseous methyl bromide fumigation. Longer fumigation periods and double doses of TERABOL produced larger bromide residues in the upper soil layer as determined by greenhouse and outdoor trials. Fumigation of peat-layer-covered greenhouse soils showed that peat had stimulating effects upon the formation of bromides.

72-0292. Thomason, I. J.; Castro,C. E.; Baines, R. C.; Mankau, R. (Dept. of Nematology, U. of California, Riverside, CA). **What happens to soil fumigants after nematode control?** *Calif. Agr. 25(9):10-12: 1971.*

For the past 15-25 years, 1,3-dibromoethane (EDB), 1,3-dichloropropane (1,3-D), and 1,2-dibromo-3-chloropropane (DBCP) have been used extensively for nematode control in California soils. Research studies show that these compounds are not persistent pesticides. Under field conditions, a number of factors combine to reduce EDB, DBCP, and 1,3-D concentrations to below detectable levels. These factors include diffusion, adsorption, and physical and/or biological degradation. While 1,3-D is toxic to many nematode-trapping fungi, DBCP only temporarily inhibits growth of beneficial fungi. EDB is actually taken up and degradated by nematode-trapping fungi and may even be utilized as a temporary carbon source. Neither residues of the parent compound nor other halide-containing organic compounds have been found in crops grown on treated soil. Furthermore, no adverse effects on the nutritional value of crops have been noted.

72-0293. Naik, M. N. (Inst. of Agriculture, Anad, Gujarat, India). **Fate of pesticides in soil.** *Pestic. 5(8): 24-26; 1971.* (9 references)

Factors affecting penetration and persistence of pesticides in soil are discussed. Sorption and leaching are of major importance in penetration. Factors regulating sorptive capacity of soil are type of clay and soil, pH, organic content, and moisture content. Ethylene dibromide, for instance, is rapidly sorbed by dry soils, the amount sorbed dropping off sharply at moisture content above 15%. At low pH, all compounds are absorbed strongly. In general, conditions favoring greater sorption favor greater persistence. Leaching, which favors transport of toxicants, depends on solubility of the toxicant in soil, water, nature of soil colloids, soil solid-phase geometry, and liquid flow rate. The percolation and action of water is very important with pesticides having a long life, such as chlorinated hydrocarbons. With water-soluble compounds whose activity depends on volatile breakdown products, air diffusion and water flow are linked. In the case of fumigants used for nematode control, diffusion is more important than water downflow. The two principal factors affecting persistence of pesticide are biological degradation and chemical breakdown. Substances that are not attacked by microorganisms can persist in soil for varying periods. Chemical breakdown is affected by soil moisture, soil humus, and soil pH. External factors such as soil erosion by wind and water and high tropical temperatures and strong sunshine accelerate decomposition of surface-applied pesticides.

72-0294. Stojanovic, B. J.; Kennedy, M. V.; Shuman, Jr., F. L. (Mississippi State University, State College, MS 39762). **Edaphic aspects of the disposal of unused pesticides, pesticide wastes, and pesticide containers.** *J. Environ. Quality 1(1): 54-62; 1972.* (14 references)

The effects of 20 analytical grade and seven formulated pesticides on the soil microflora were tested in a calcareous West Point loam. Five tons/acre of the respective pesticides were deposited in the soil and incubated for 56 days. The amount of carbon dioxide evolution served as estimation for biodegradation and the plate counts determined the effects on the microbial population. Eight of the formulations and four of the standards were evidently partly degraded. Bacterial growth was rigidly inhibited by single pesticides but fungi and streptomyces were affected much less severely. Little ash was produced when liquid formulation were incinerated at 900C. Solids, however, upon incineration yielded a concrete amount of incombustible residues. Toxic elements such as bromine, arsenic, zinc, etc, were found through the analysis of the ash.

72-0295. Shuman, F. L.; Stojanovic, B. J.; Kennedy, M. V. (Mississippi Agricultural and Forestry Experiment Sta., State College, MS 39762). **Engineering aspects of the disposal of unused pesticides, pesticide wastes, and pesticide containers.** *J. Environ. Quality 1(1): 66-70; 1972.* (11 references)

There have been numerous methods proposed for the disposal of pesticides and containers, but the most beneficial in reducing these materials is the incinerator method. Much work and experimentation have been done to bring this technique to a safe level of disposal (without contributing to water, air, and soil pollution). Positive steps can be taken to utilize this method in bringing about an environment of greater quality now and in the future.

72-0296. Bradley, J. R.; Sheets, T. J.; Jackson, M. D. (Pesticides Residue Research Lab., North Carolina State Univ., Raleigh, NC 27607). **DDT and toxaphene movement in surface water from cotton plots.** *J. Environ. Quality 1(1): 102-4; 1972.* (15 references)

During the 1969 growing season, 13.4 kg/ha of DDT was applied to cotton (*Gossypium hirsutum* L.) and between July 1969 and February 1970 2.83% was found in natural runoff. Also 26.8% kg/ha of toxaphene was applied and 0.36% was found to be in natural runoff. In runoff, 96% of DDT and 75% of toxaphene was in the sediment fraction. Over the season, the same amounts of DDT and toxaphene were applied and the percentage in the runoff was 1.03% for DDT and 0.61% for toxaphene. A high percentage of these pesticides was not recovered since a large amount remained as soil residue. A small pond within one experimental watershed was tested for residues of DDT before and after spraying. The results ranged from less than 0.35 ppb before to 13.4 ppb during the spraying season. Toxaphene residues were found to be greater than DDT residues; they ranged from less than 1 ppb before spraying to 65 ppb at midseason.

72-0297. Singh, J.; Krueger, H. R.; Deshmukh, S. N.; Bindra, O. S. (Punjab Agricultural Univ., Ludhiana, India). **Dissipation of parathion residues from cabbage (*Brassica oleracea* L. var. *capitata* L.).** *Indian J. Agr. Sci. 41(4): 328-333; 1971.* (12 references)

Field-grown cabbage plants, which were 114, 124, and 135 days-old, were sprayed with 0.025% parathion emulsion at the rate of 57.4, 43.0 and 93.3 g ai per ha. Gas-liquid chromatography with potassium chloride thermionic detector was used to help detect the residues and deposits. Within one day the first deposits of parathion in the cabbage were reduced to less than one ppm. The residue could not be detected 21 days after spraying. The half-life value of parathion on cabbage varied from 1.67 to 1.81 days. Upon washing, rubbing, and cooling of the vegetable, the first parathion deposit was scattered by 84-87% and one-day residue by 77%. Market samples were tested by gas-liquid chromatography and no parathion, nor any organophosphorus or chlorinated insecticide was detected.

72-0298. Handa, S. K.; Misra, S. S.; Verma, D.; Dewman, R. S. (Division of Agricultural Chemicals, Indian Agricultural Research Institute, New Delhi, India) **Dissipation of parathion residues from safflower (*Carthamus tinctorius* L.)** *Indian J. Agr. Sci. 41(4): 333-5; 1971.* (4 references)

A schedule of parathion application to Safflower (*Carthamus tinctorius* L.) for effective control of the aphid *Macrosiphum sonchi*Wwalk. was tested for insecticidal residues. The crop was sprayed 3 times with 0.05 and 0.1% emulsions of parathion at 100 L/ha at 25 day intervals starting from germination. Residues were measured in leaves and green pods 3,7, and 11 days after each application and in the grains 30 days after the last application. By the eleventh day, residues of all sprayings in all measured parts of the plant were below the FDA tolerance limit of 1 ppm. On the thirtieth day after the last spraying, no parathion could be detected in grain samples.

72-0299. Hill, K. R. (Entomology Research Div., U.S. Dept. of Agriculture, Beltsville, MD 20705). **IUPAC Commission on terminal residues.** *J. Ass. Offic. Anal. Chem. 54(6): 1316-22; 1971.* (26 references)

The IUPAC Commission considered the report of the "Half-life" Working Party on four terminal residues:

lindane, chlordane, cyclodiene compounds, and organochlorine compounds. Seventy per cent of the residue of 14-C-lindane in or on plants was found to be hydrophilic metabolites. No metabolite was found in the soil after foliar application but 10% of the residue was present as 14-C-lindane. Studied indicate that *gamma*-BHC is not converted to *beta*-BHC. Oxychlordane (C10 H4 O C18), an animal metabolite of chlordane, is formed only in animals. Chlordane residues found in cuticle of root crops, such as potatoes, can be accounted for by the incorporation of minute particles of soil in skin waxes. Chlordane residues in root crops in which *gamma*-chlordane is a component are concentrated in the peel, and peeling or cooling reduces or eliminates the residue. Residues of *trans*-chlordane in cabbage were high while those in carrots were low. Application of 14-C-endrin resulted in residues consisting not only of endrin but also of a very hydrophilic substance. There was no new information concerning the organochlorine compounds toxaphene, chloropropylate, and dicofol.

72-0300. DeLoach, H. K.; Hemphill, D. D. (Dept. of Horticulture, Univ. of Missouri, Columbia, MO 65201). **Effect of cooking utensil composition and contents on the reductive dechlorination of DDT to DDD.** *A.J. Offic. Anal. Chem. 54(6): 1352-1356; 1971.* (9 references)

The reductive dechlorination of DDT to DDD by some cooling utensil compositions and contents is demonstrated and the identification of specific reducing agents of DDT is investigated. Iron is found to be the most active reducing agent of DDT. A progressive loss of DDT and accumulation of DDD from DDT are observed when the DDT standard is boiled with double-distilled water in metal utensils (iron, stainless steel, or aluminum) or in glass utensils containing iron powder. Non-metal utensils (Teflon, glass, or enamel) by themselves do not give an accumulation of DDD from DDT despite considerable loss of DDT. Teflon-coated utensils are ineffective in the reduction of DDT and tend to adsorb pesticides on their surface. A substance (or substances) which is present in vegetables also acts as a DDT-reducing agent as shown by boiling DDT with vegetables in glass utensils. (Author abstract by permission)

72-0301. Yip, G.; Onley, J. H.; Howard, S. F. (Division of Chemical Technology, Food and Drug Administration, Washington, D.C. 20204). **Residues of maneb and ethylene thiourea on field-sprayed lettuce and kale.** *J. Ass. Offic. Anal. Chem. 54(6): 1373-1375; 1971.* (4 references)

Two crops, lettuce and kale, were treated with a maneb formulation at a rate of 2.4 lb ai/acre. Samples were harvested at various times after application for residue analysis. The residue determined were maneb and ethylene thiourea (ETU). On lettuce, residues of maneb decreased from 45 to 5 ppm in 15 days. On kale, the decrease was from 90 to 15 ppm in seven days. With both crops, ETU which was already present in the formulation did not accumulate, but quickly decreased from 0.6 ppm to undetectable amounts after seven days. (Author abstract by permission)

72-0302. Steward, D. K. R.; Chisholm, D. (Research Station, Canada Department of Agriculture, Kentville, Nova Scotia, Canada) **Long-term persistence of BHC, DDT and chlordane in a sandy loam soil.** *Can. J. Soil. Sci. 51(3): 379-83; 1971.* (12 references)

Residues of technical BHC, DDT and chlordane in Berwick sandy loam soil in Nova Scotia were measured 15 years after the last application. Residues were 7.5, 55 and 16 percent respectively of the amounts applied. The *alpha-*, *beta-*, *gamma-*, and *delta*-isomers of BHC were present in relative percentages of 36, 36, 16, and 12 respectively. The *beta*-isomer was most persistent, 44% of the amount applied still being present. DDT residues consisted chiefly of *p,p'*-DDT, *o,p'*-DDT and *p,p'*-DDE with traces of *p,p'*-DDE and *p,p'*-DDD. Chlordane residues were principally the *alpha-* and *gamma*-isomers with small amounts of heptachlor epoxide. In 15 years there was little downward or lateral movement of the insecticides in the soil.

72-0303. Head, W. K.; McKercher, R. B.; (Saskatchewan Institute of Pedology, University of Saskatchewan, Saskatoon, Canada). **Recovery of pesticide residues from Chernozemic soils.** *Can. J. Soil Sci. 51(3): 423-30; 1971.* (15 references)

Recovery of 5 organochlorine pesticides from three Chernozemic soils at various moisture contents was investigated. A 63-Ni electron-capture GLC technique was used. In soil fortified at 0.02 ppm of aldrin, dieldrin, lindane and triallate, maximum average recoveries ranged from 77% to 117%. In soil fortified at 0.2 ppm of *p,p'*-DDT, maximum average recoveries ranged from 72% to 92%. Moistening the soil before extraction was generally beneficial. However, the percentage moisture necessary for maximum recovery seemed to depend both on the soil type and the pesticide. Residues were measured in several cultivated fields with a history of pesticide application and in soils under DDT-treated trees. Residues of these chemicals were less than 0.1 ppm in fields, but in the soil under DDT-treated trees, residues were considerably higher. This was probably due to method and rates of application.

72-0304. Tachikawa, R. (Ehime University, Matsuyama, Japan). **[Mechanism of BHC pollution.]** *Sci. Asahi 30(12): 45-51; 1970.* (Japanese)

In Japan, benzene hexachloride, BHC, is used as

an insecticide. *Beta*-BHC has a higher toxicity level than *alpha*-BHC, is less soluble in water, and is more persistent, therefore, more *alpha*-BHC is used in western Japan. Because BHC is so widely used there is very little fresh water which is unpolluted since the agricultural waters on which BHC is used flow into the rivers and the sea. BHC condenses in living animals because of their contact with the soil and water. The residue concentration in water is low but, nevertheless, it is adsorbed by the surface layer of soil and when it rains it is dissolved by the water and readsorbed by the plants. UV-rays break down gaseous BHC which enters the atmosphere but re-enters the cycle through the rain. The amount of BHC varies with the seasons ranging from 0.1 ppb in the Inland Sea to 144 ppb in Matsuyama City. Beef and dairy products contribute a large amount of BHC in the diet; for adults 0.6 mg per is an allowable limit. The use of the BHC and DDT decreased but other insecticides are expensive, therefore, other safer agricultural chemicals must be developed and the old ones improved upon.

72-0305. Klisenko, M. A.; Vekshtein, M. Sh. (All-Union Research Institute for Hygiene and the Toxicology of Pesticides, Polymeric and Plastic Substances, Kiev, USSR). **O skorosti razlozheniya i produktakh prevrashcheniya etilen-bis-ditiokarbamatov v razlichnykh sel'skokhozyaistvennykh kul'turakh. [The decomposition rate and the transformation products of ethylene-bis-dithiocarbamates in various farm cultures.]** *Vop. Pitan. 30(5): 79-81; 1971.*

Residual amounts of entylene-bis-dithiocarbamates (zineb, polycarbazine) and their transformation products (ethylene thiuram monosulfide, ethylene thiocarbamide, sulfur) were studied in apples, strawberries and sugar beet leaves by thin-layer chromatography and UV spectrophotometry. The rate of dithiocarbamate decomposition and the nature of the transformation products depended on the plant species and on the pH of the cellular juice. Dithiocarbamate decomposition occurred quickly in an acidic medium and slowed down with an increased pH. When strawberries and leaves of sugar beets were treated with polycarbazine, the strawberries had a higher content of ethylene thiocarbamide, and the sugar beet, ethylene thiuram monosulfide.

72-0306. Lapchenko, V. S.; Vorob'eva, N. M. (Kiev Research Institute for the Hygiene of Nutrition, Kiev, USSR). **Ostatochnye kolichestva pestitsida antio v yablokakh i grushakh i organolepticheskie svoistva plodo. [Residual amounts of the pesticide anthio (formothion) in apples and pears and the organoleptic characteristics of the fruit.]** *Vop. Pitan. 30(5): 83-84; 1971.* (Russian)

Changes in the organoleptic properties of the fruit disappeared within 3 to 5 days after treatment with formothion. The amount of residue in the fruit depended on the time since the treatment. No residue was found 2 weeks after treatment. Pears had a higher residue content than apples.

72-0307. Cox, J. L. (Dept. of Biology, Southeastern Massachusetts Univ., North Dartmouth, MA 02747). **Uptake, assimilation, and loss of DDT residues by *Euphausia pacifica*, a euphausiid shrimp.** *Fish. Bull. 69(3): 627-33; 1971.* (16 references)

The euphausiid shrimp (*Euphausia pacifica* Hensen) from the California coast acquires sufficient DDT residue from its food to account for amounts found in its tissues. Gas-liquid chromatographic analyses of DDT residues showed the concentration vs. size function in *E. pacifica* to be different from the function predicted by a theoretical food assimilation model. Direct uptake of 14-C DDT from water was rapid and partially reversible; equilibrium being reached within 72 hr for smaller animals (less than 3 mg dry weight) and longer for larger animals. After two weeks exposure to 14-C DDT, the shrimp were placed in unlabelled flowing water. The 14-C DDT was retained in higher amounts by larger animals (greater than 3 mg dry weight). The reason for the unexpected higher concentrations of DDT residue in smaller animals may be due to the possibilities that; the food of the immature animals contains more DDT; direct uptake from water is greater in smaller animals because of their higher area-volume ratios, or smaller animals may not have used any of their lipid reserves thereby retaining more of the ingested DDT.

72-0308. Le Boeuf, B. J.; Bonnell, M. L. (Crown College, U. of California, Santa Cruz, CA 95060) **DDT in California sea lions.** *Nature 234(5324): 108-110; 1971.* (25 references)

Tissue samples from healthy (5), sick (6), and dead (14) California sea lions (*Zalophus californianus*) were chromatographically analyzed for residues of DDT and its metabolites. These animals inhabit coastal waters of California and Mexico that receive agricultural runoff from California valleys where DDT is extensively used. Total DDT residues in the blubber and brains of the 25 animals were 41-2678 ppm and 0.2-34 ppm, respectively. These values are higher than those reported for other marine mammals. DDT residues in the muscle of four healthy adults averages 1.2 plus or minus 0.8 ppm wet weight and 418 plus or minus 246 ppm lipid weight. Mean concentrations in the liver of the healthy adults and three subadults were 17 plus or minus 10 ppm wet weight and 677 plus or minus 229 ppm lipid weight. Studies on other animals suggest several possible effects of high DDT concentrations on California sea

lions: reproductive failure, decreased resistance to stressful infectious agents, and an acute toxic effect on the central nervous system.

72-0309. Allan, G. G.; Chopra, C. S.; Neogi, A. N.; Wilkins, R. M. (College of Forest Resources, Univ. of Washington, Seattle, WA 98105). **Design and synthesis of controlled release pesticide-polymer combinations.** *Nature 234(5328): 349-51; 1971.* (16 references)

Pest control will always necessitate the use of pesticides. Most of the pesticides in use are long-lived and incorporate themselves into the food chain and become environmental hazards; the pesticides with short lives, however, are not as effective. An investigation has been undertaken to find out if pesticide-polymer combinations could be a means of securing controlled release of a biodegradable pesticide in approximately the correct amount needed over a certain period of time. Two approaches have been reported: pesticide release by diffusion through polymers and pesticides release by degradation of a polymer containing the pesticide as a pendent side chain. It has been found that both of these alternatives tend to reduce the environmental hazards associated with the continued use of pesticides.

72-0310. Plimmer, J. R.; Klingebiel, U. I. (Plant Science Research Div., Agricultural Research Service, U.S. Dept. of Agriculture, Beltsville, MD 20705). **Riboflavin photosensitized oxidation of 2,4-dichlorophenol: assessment of possible chlorinated dioxin formation.** *Science 174(4007): 407-408; 1971.* (15 references)

Dimeric products are formed by riboflavin-sensitized photooxidation of 2,4-dichlorophenol. The products of this reaction were examined to determine whether chlorinated dibenzo-*p*-dioxins could be formed from chlorophenols in water by the action of light of wavelengths greater than 280 nm. Dimers are formed by union of phenoxy radicals through carbon-carbon or carbon-oxygen bonds. 4,6-dichloro-2-(2,4-dichlorophenoxy)phenol was obtained in greater quantity than other dimers. Products were characterized by combined gas chromatography and mass spectrometry. Chlorinated dibenzo-*p*-dioxins which could result from ring closure of a 2-phenoxyphenol derivative were not detected in the products of photolysis. The failure to detect chlorinated dibenzo-*p*-dioxins may result from the rapid photolytic breakdown of the lower chlorinated dibenzo-*p*-dioxins. Under environmental conditions, dioxins are unlikely products of the lower chlorinated phenols or phenoxyalkanoic acids. (Author abstract by permission)

72-0311. Gunner, H. B. (Massachusetts Univ., Dept. of Environmental Sciences, Amherst, MA). **Microbial econosystem stress induced by an organophosphate insecticide.** *Wetensch. Genet. 35(2): 581-97; 1970.* (5 references)

Diazinon, an organophosphate, has a definite decomposition pathway and an impact on soil microflora. The population of a certain *Arthrobacter* sp., are increased upon application of diazinon since it can utilize the side chain of diazinon as its only source of carbon or sulfur, and of phosphorous. *Streptomyces* sp. increase after *Arthrobacter sp.* increase, and these two bacterial species synergistically break down the pyrimidine ring of diazinon; a pathway for diazinon is postulated. Other bacteria utilized *Arthrobacter sp.* more readily than commensal protozoans, inferring that the soil population equilibrium may greatly be affected by the application of diazinon.

72-0312. Aulerich, R. J.; Ringer, R. K.; Seagran, H. L.; Youatt, W. G. (Fur Animal Project, Dept. of Poultry Science, Michigan State Univ., East Lansing, MI). **Effects of feeding coho salmon and other Great Lakes fish on mink reproduction.** *Can. J. Zool. 49(5): 611-615; 1971.* (5 references)

In 1968 a study was conducted to ascertain if the reproductive problems of the mink were due to the Great Lakes coho salmon which was 30% of their diet. Other species of fish from the same lakes were also fed to the mink for comparison. The coho salmon was fed to the mink before and during reproduction. This diet caused a reproductive failure and a kit mortality as high as 80% depending on the amount of coho salmon fed as well as duration of feeding. Canned by-products of Great Lakes coho salmon were fed to adult mink at the same level as the raw salmon and this resulted in mortality of the mink. Mortality and reduced reproduction also occurred when the mink were fed other types of fish (bloater chub, yellow perch) from the same source. Lake Erie yellow perch and West Coast coho salmon in the diet did not cause excessive mortality or impair reproduction. There was a relationship between the amount of pesticide residue (DDT, dieldrin) found in the fish and the reproduction decline and kit mortality. So this indicates that it is not coho salmon *per se* which causes these disorders but appears to be dependent upon the species of fish and its environment.

72-0313. Van Steyvoort, L.; Zenon-Roland, L.; Martens, P. H. (Institut Belge pour l'Amelioration de la Betterave Tienen, Belgium). **Residus de pesticides organo-chlores dans la betterave et ses sous-produits. [Organochlorine pesticide residues in beet-roots and in their secondary products.]** *La Sucrerie Belge 90(10): 491-97; 1971.* (10 references) (French)

In Belgium, the use of aldrin, heptachlor, and chlordane in beet cultivation is important and values for pesticide residues in beet and sugar factory products have been found. The beets which were used came from experimentally treated fields and the sugar factory products were from Oreye and Gembloux (heptachlor) and from Wez-Velvain (aldrin). Some sugar factory products were also acquired from an experimental plant at Tiene; they processed roots containing 0.0077 ppm of heptachlor and 0.0075 ppm of heptachlor epoxide. After determination of the residue levels in beet and sugar products, the authors consider the pesticide residues as toxicologically negligible.

72-0314. Veith, G. D.; Lee, G. F. (Water Chemistry Laboratory, Univ. of Wisconsin, Madison WI 53706). **Chlorobiphenyls (PCBs) in the Milwaukee River.** *Water Res. 5(11): 1107-15; 1971.* (21 references)

Water from the Milwaukee River was analyzed and it was found that the river from West Bend to Lake Michigan contained isomers of chlorinated biphenyl analogous to ones used in industry. Industrial discharges, municipal sewage treatment plant effluents, and the Milwaukee River water near sewer outfalls were analyzed and the results point to municipal and industrial wastes as the contributors of the presence of PCBs in natural waters. It is suggested by PCBs concentration level (*mu*g/l) that water transport from metropolitan areas is responsible for PCBs in Lake Michigan.

72-0315. Rodler, I.; Molnar, P.; Kohegyi, I. (Baranya County Public Health Epidemiology Station, Pecs, Hungary). **Egyes szerves foszfateszter tartalma permetezoszerrel kezelt alma szermaradekanak alakulasa kulonbozo tarulasi korulmenyek kozott. [Changes in the residue contents of apples treated with certain sprays containing organic phosphate esters, under various conditions of storage.]** *Elelmiszervizsgalati Kozlem. 17(3): 151-56; 1971.* (6 references) (Hungarian)

Apples were sprayed with two types of pesticides Nogos (50% O,O-dimethyl-2,2-dichlorovinylphosphate) and Wofatox (18% methylparathion) under laboratory conditions to investigate the rate of decomposition of the pesticides at different temperatures. After spraying, 4.7 mg/kg of the Nogos residue and 5.3 mg/kg of the Wofatox residue was detected. The decomposition periods are definitely affected by the temperature.

72-0316. Platinow, N. S.; Funnell, H. S.; Bullock, D. H.; Arnott, D. R.; Saschenbrecker, P. W.; Grieve, D. G. (Dept. of Biomedical Sci., Canada Dept. of Agriculture, Animal Pathology, Lab., Guelph, Ont., Canada). **Fate of polychlorinated biphenyls in dairy products processed from the milk of exposed cows.** *J. Dairy Sci. 54(9): 1305-8; 1971.* (18 references)

Two actively lactating Jersey cows were given orally 10 and 100 mg/kg of polychlorinated biphenyls (PCB) as a single dose. The milk was collected and Cottage cheese, whey, cream, skim milk, and nonfat dry milk were made. Concentrations and metabolic forms of PCB were determined in the whole milk and in the processed dairy products. Metabolic forms of these biphenyls were not significantly altered by various processes. Heating skim milk substantially decreased total PCB. Distribution of PCB in the prepared milk products indicates a strong predilection for them in the lipid phase. (Author abstract)

72-0317. Schweizer, E. E. (Plant Science Research Division, Agricultural Research Service, U.S. Department of Agriculture, Colorado Agr. Exp. Sta. Ft. Collins, CO). **Herbicidal activity of chloroacetamides and pyridazinones on sugarbeets and weeds.** *J. Amer. Soc. Sugar Beet Technol. 16(5): 359-68; 1971.* (10 references)

Studies were conducted to determine the herbicidal activity of two *alpha*-chloroacetamides and three pyridazinones on sugarbeets (*beta vulgaris* L.) and common lambsquarters (*Cheno podium album* L.), foxtail millet (*Setaria italica* (L.) Beauv.), kochia (*Kochia scoparia* (L.) Schrad.), pigweed(*Amaranthus* spp), and wild buckwheat (*Polygonum convolvulus* L.) and to determine the persistence of several of these chemicals in the soil. The two chloracetamides, propachlor and delachlor, controlled foxtail millet best, while the pyridazinones, pyrazon, BAS 2430 (5-amino-4-bromo-2-phenyl-3(2*H*)-pyridazinone), and BAS 2572 [5-(*alpha*-hydroxy-*beta*, *beta*, *beta*-trichloroethyl)amino-4-bromo-2-phenyl-3-(2*H*)-pyridazinone] controlled common lambsquarters and wild buckwheat. Both groups effectively controlled pigweed but not kochia. The herbicides BAS 2430 and delachlor were more effective than the standard herbicide cycloate in reducing the average stand of all five weeds, and yields of roots and sugar were equivalent to that produced in plots treated with cycloate or hand-weeded. Treatment with propachlor, pyrazon or BAS 2430 reduced pre-thinning stands of sugarbeets, suppressed growth or did both in at least one year. Residues of BAS 2430, delachlor and pyrazon were detected in soil 8 months after application.

72-0318. Blazquez, C. H. (Univ. of Florida, Immokalee, FL). **Residue monitoring: a system for timing spray schedules.** *Phytopathology 61(8): 885; 1971.*

By relating the decay rate of fungicide leaf residues with their ability to inhibit spore germination in a

bioassay test, a system for timing spray schedules was developed. Beginning three hr after spraying and every 24 hr thereafter until complete breakdown occurred, foliar residues of Difolatan 4F (*cis*-*N*-1,1,2,2-tetrachloroethyl thio-4-cyclohexane-1,2-dicarboximide) sprayed at the rate of 3 pints/100 gal of water were washed with benzene from tomato leaves. Thin-layer chromatography was used to analyzed the Difolatan residue. To determine the percent germination of *Alternaria solani* spores with daily concentrations of fungicide residue, Neely's bioassy test was used. Variations of Difolatan residues were from 400 to 0 ppm at 3 hr and 7 days, respectively. In the bioassay test, spore germination increased 6 to 100% from 3 to 7 days after spraying. Concentrations above 75 ppm were fungistatic, while above 100 ppm they were fungicidal. By knowing the Difolatan decay rate and foliar residue, it was possible to estimate the number of days of effective protection. As the results suggest, the proper timing of fungicidal sprays for disease control can be accurately determined by this analytical bioassay method.

See also 72-0244 72-0246 72-0249 72-0329 72-0332 72-0331 72-0352 72-0354 72-0355 72-0356 72-0357 72-0358 72-0359 72-0360 72-0374 72-0381 72-0382 72-0383 72-0388 72-0389 72-0390 72-0391 72-0392 72-0393 72-0396 72-0397 72-0398 72-0400 72-0401 72-0403 72-0404 72-0405 72-0406 72-0407 72-0409 72-0410 72-0411 72-0413 72-0418 72-0419

72-0319. Hensel, G.; Duerr, F. (Tuebingen University Medical Clinics, Tuebingen, Germany). **Dialysetherapie bei Paraquatintoxication., [Dialysis treatment in a case of paraquat poisoning.]** *Med. Welt 22(45): 1790-1794; 1971.* (28 references) (German)

A 46 yr-old man attempted suicide by ingesting 30 ml of a 20% paraquat preparation. The patient presented the typical poisoning symptoms such as vomiting followed by pharyngitis, esophagitis, ulcerations of the gastrointestinal tract, liver swelling, acute kidney failure, myocarditis, and died 12 days following poison intake. The bulk of the poison was removed by forced diuresis within 24 hr following the accident. Peritoneal dialysis was carried out 4 hr following poison intake with no success. No paraquat was detected in the blood either due to its enhanced excretion through urine, to its fast binding of protein or to its slow intestinal resorption. No correlation between the paraquat concentrations in blood and poison-induced damage of the organ tissues could be ascertained. In order to obtain results with dialysis procedures a certain concentration of poison should exist within the blood stream and should be related to the induced damage in the organs. Forced diuresis appeared to be satisfactory for the removal of the compound under the above circumstances.

72-0320. Anonymous. **Pestizide, ein Umweltproblem. [Pesticides, an environmental problem.]** *Grundlagen Landtech. 21(6): 179-180; 1971.* (German)

The ecology endangering aspects of pesticides are discussed. The presence of DDT was detected in Antarctic penguins where small concentrations inhibit their perpetuation. DDT-induced alterations in the egg shell thickness may lead to the extinction of entire bird species. The liposoluble feature of DDT allows is absorption by water plankton which leads to the contamination of fish. Fish eating carnivores accumulate up to 75 ppm of DDT. Reference is made to the dangers produced by the transport of pesticides and the Rhine River endosulfan poisoning episode in June 1969. The polychlorobiphenyl derivatives which affect hormone metabolism constitute one of the most dangerous factors on environmental pollution. Measures for environmental protection from pesticide pollution should be taken on an international scale. Future trends should include the search for biodegradable target-specific compounds. These compounds should allow no immune processes developing resistance against them within the target species. Efficacy of treatment with certain hormones interfering with the vital cycle of the target insect should be investigated. The development of pest-resistant plant breeding procedures is discussed. However, this latter involves precise knowledge of all climatological and biological features on a given region.

72-0321. Anonymous. **Paraquat poisoning.** *Lancet II (7732): 1018-1019; 1971.* (6 references)

Accidental poisoning due to paraquat (1,1-dimethyl-4-4'-bipyridylium) has resulted in an estimated 124 deaths world wide. Most of the deaths for which details are known were caused by drinking the 20% concentrate Gramoxone, which is available only from licensed dealers for use in agriculture or horticulture. Of the four paraquat preparations, only Weedol (granules containing paraquat and diquat) is generally available to the public. Only one case of fatal poisoning from Weedol is known. The fatal dose of paraquat is thought to be 15 ml. In severe poisoning, the immediate effects are vomiting, abdominal discomfort, and burning of the mouth and throat, followed by renal and hepatic failure. Progressive respiratory embarassment comes five to 10 days later, sometimes after a period of apparent recovery. Early treatment is by induced vomiting, stomach wash-out, and forced diuresis; but there is little agreement about the usefulness of other measures, including dialysis. Manufacturers should develop formulations which by altered smell, viscosity, or color will make accidental ingestion of paraquat concentrate less likely. Of the methods proposed, making the preparation thixotropic looks the most promising.

72-0322. McParland, P. J.; Thompson, R. H.; Regan, M. (Veterinary Research Labs., Stormont Belfast BT4 3SD, Northern Ireland). **Deaths in cattle following ingestion of lead arsenate.** *Vet. Rec. 89(16): 450-451; 1971.* (3 references)

Acute poisoning occurred in a group of 11 young grazing cattle following ingestion of lead arsenate stored in a rusted container which ruptured during a flood. The lead arsenate had once been used for apple-tree spraying. Examination of the carcasses of the three animals who died revealed rumenitis with shredding of the ruminal mucosa. The underlying muscular layer was thickened, congested, and hemorrhagic. In each the reticulum and omasum appeared normal, but there was a severe abomasitis. There was also enteritis involving the small intestine and the first few feet of colon. Kidney lead levels did not exceed 4 ppm, which is below the accepted toxic level.

72-0323. Khasanov, Y. Kh. (Khorezm Regional Sanitary and Epidemiology Station, Urgench, USSR). **Redkiy sluchay otravleniya vodoy, zagryaznennoy sel'khozyadokhimikatom. [A rare case of poisoning with pesticide-contaminated water.]** *Gig. Sanit. 36(9): 96; 1971.* (Russian)

Several cases of poisoning which occurred 1-4 hr following water consumption from a fountain installed

in a mining plant are reported. This water contained more than 150 mg/l of arsenic upon analysis. Further investigation revealed the fountain to be located where agricultural poisons had been stored 15 years ago. A period of stormy rains preceding the poisoning episode appears to have enhanced the infiltration process of arsenic through the ground layers. The importance of systematic control of the quantitative expanditure of such poisons utilized in agriculture to prevent the occurrence of further accidents is emphasized.

72-0324. Fowler, J. F.; Newsom, L. D.; Graves, J. B.; Bonner, F. L. (Louisiana State U., Baton Rouge, LA). **Effect of dieldrin on egg hatchability, chick survival and eggshell thickness in purple and common gallinules.** *Bull. Environ. Contam. Toxicol. 6(6): 495-501; 1971.* (21 references)

A study was made of the effect of dieldrin on egg hatchability, chick survival, and eggshell thickness in the purple (*Porphyrula martinica* L.) and the common gallinule, (*Gallinula chloropus* L.). During the summers of 1968-1969, 225 eggs were taken from 37 purple gallinule nests and 66 eggs from eight common gallinule nests in rice fields treated with agricultural insecticides. In 1968, the average dieldrin contamination of purple and common gallinule eggs was 9.36 and 17.48 ppm, respectively. Lower levels of dieldrin were detected in 1969 eggs, probably as the result of curtailed use of dieldrin-treated seed rice. The average 1969 contamination was 3.80 ppm for purples and 4.78 ppm for commons. In both years, the hatch of eggs and survival of chicks from gallinule populations in rice fields was not significantly different from that of control eggs collected in protected marsh areas. The survival success (60-81%) of purple and common gallinules was high considering the reported success (50-75%) in rearing similar wild birds in captivity. Although a significant correlation between shell thickness and *p,p'*-DDE (+*p,p'*-DDT) was obtained with common gallinules, there was no correlation between shell thickness and dieldrin contamination in either gallinule species. These results suggest that the reproductive potential of purple and common gallinules is not seriously threatened by the presence of rather high dieldrin levels in their eggs.

72-0325. Sungur, T. (Dept. of Hygiene and Preventive Medicine, Ankara Univ. Medical School, Ankara, Turkey). **Fosforlu ensektisitlerin saglik zararlari ve bu yonden tarim iscilerinde yaptigimiz bir arastirma. [A study of the harmful effects of phosphorus containing insecticides on agricultural workers.]** *Tip Fak. Mecm. 24(1): 1671-83; 1971.* (18 references) (Turkish)

The harmful effects of these pesticides was determined on personnel employed at the "Ataturk Forest Farm" and the "Directorate of Agricultural Pest Control" by measuring the levels of serum acetyl cholinesterase (AChE). The AChE activity in 58 exposed individuals was 153 as compared with a level of 197 for 58 controls, *P* less than 0.001. Eighteen of the control individuals were tested for AChE activity before and after exposure to organophosphates. The AChE level fell from 204 to 108, *P* less than 0.0001. In 17 of these workers, the mean was found to be 70% below pre-exposure levels. This is considered to be a critical reduction of enzyme activity. Dangers such as these can best be eliminated by using preventive measures and in proper training of the workers.

72-0326. Lawton, R. L.; Johnson, L. G.; Morris, R. L. (Dept. of Surgery, U. of Iowa College of Medicine, Iowa City, IA 52240). **Pesticide levels in patients on maintenance dialysis.** *Ind. Med. Surg. 40(8): 22-24; 1971.* (9 references)

Serum pesticide levels were determined in 18 patients with end-stage renal disease before commencement of maintenance dialysis, in 15 patients on maintenance dialysis, and in the same 15 patients prior to and after dialysis. The major pesticides analyzed were DDT derivatives in the form of DDT equivalents (ppb). Serum DDT levels average 11.22 ppb in end-stage renal disease patients and 7.27 ppb in patients on maintenance dialysis vs 22.71 ppb for a control group of 201 persons. Although there was no correlation between pre- and post-dialysis levels, there was a statistically significant correlation between pesticide levels and number of months on dialysis. Tissue DDT levels from long-term dialysis patients were consistently lower than in the average population.

72-0327. Araki, S.; Ushio, K.; Suwa, K.; Abe, A.; Uehara, K. (Dept. of Internal Medicine, Tokyo Rossi (Labor Accident) Hospital, Tokyo, Japan). **Methyl bromide poisoning: A report based on fourteen cases.** *Sangyo Igaku 13(6): 507-513; 1971.* (11 references)

Fourteen cases of methyl bromide poisoning were analyzed for initial symptoms and major clinical manifestations of the disease. Ten of the patients were fumigators, and all but one became ill in connection with fumigation of wood or foodstuff. The exception was a chemist working with tribromosalicylanilide. All subjects were males from 26-62, with a mean age of 38. Initial symptoms were headache, dizziness, nausea, and vomiting. These appeared after a latent period of several minutes to several hours. Major symptoms were gait ataxia (11 cases), contracted visual field (8 cases), positive Romberg's sign (6 cases), exaggerated deep reflexes (6 cases), and transient hypertension (5 cases). There were no findings suggesting renal or hepatic involvement. Six subjects resumed normal gait after six to eight months. Eight cases were classified as chronic, four as acute transient, and two as acute severe.

72-0328. Kwiatkowski, M.; Zoledziowska, J. (Inst. of Organic Chemistry, Warsaw, Poland). **Protection of man and his environment against side effects from the use of pesticides.** *Int. Chem. Eng. 11(4): 615-622; 1971.* (37 references)

In Poland, pesticides are officially rated on the basis of a statistically determined dose of acute oral toxicity for white rats. Values constituting at most one percent of designated toxic doses are considered safe. At present, 70 Polish-produced pesticides are classifled according to their toxicity and danger. The classification, which is given, enables the correct assignment of pesticides as poisonous, safe, or combustible. For each pesticide, there are regulations governing commercial circulation, transport, storage, and use–all intended to protect living things from the side effects of pesticides. The range of thermatic regulations is indicated, and 10 basic conditions for pesticide use and handling are summarized. Specific regulations are cited in the appended bibliography. Also given were the maximum allowable concentrations of 18 pesticides in surface waters and air production quarters. (Originally published in *Przem. Chem. (3): 164-169; 1970.)*

72-0329. Blus, L. J.; Heath, R. G.; Gish, C. D.; Belisle, A. A.; Prouty, R. M. (Bureau of Sport Fisheries and Wildlife, Patuxent Wildlife Research Center, Laurel, MD 20810). **Eggshell thinning in the Brown Pelican: Implication of DDE.** *BioScience 21(24): 1213-1215; 1971.* (26 references)

Seventy eggs from 12 brown pelican (*Pelecanus occidentalis*) colonies were examined for the relationship between insecticide residues and shell thinning. DDT metabolites were analyzed by column chromatography, polychlorinated biphenyls by thin-layer chromatography, and mercury by the neutron activation method. Eggshell thinning was found as 135 ppm in California eggs, 3.3-10.6 ppm in South Carolina eggs, and 0.2-6.0 ppm in Florida eggs. PCB's in California eggs were similar to those found in the Southeastern eggs (less than 1.0-11.0 ppm). Residues of other compounds did not exceed 2.8 ppm in Southeastern eggs or 4.6 ppm in California eggs. As determined by stepwise regression analysis, DDE was the only residue accounting for a significant percentage variability in three eggshell parameters: thickness, weight, and thickness index. When colony means were used as the sampling unit, DDE accounted for at least 68.0% of the variability in each parameter. The brown pelican is, therefore, extremely susceptible to DDE-induced eggshell thinning.

72-0330. Razeghi, N. (The University of Oklahoma, Norman OK 73069). **The effects of kerosene, a larvicide, on the performance and evaporational losses of waste stabilization ponds.** *Diss. Abstr. Int. 32(5): 2781; 1971.*

A research was designed to investigate the effects of kerosene, a larvicide extensively employed in mosquito control programs, on the operational performance and on controlling evaporational losses from waste stabilization ponds operated at 30 lbs of BOD per acre per day under laboratory conditions. Evaporation control was evaluated and compared with a similar pond not containing the larvicide and with a body of water of identical geometry. The effects on pond performance were evaluated by determining the BOD, COD, and organic nitrogen reductions along with the dissolved oxygen and pH of the pond with the larvicide and comparing these with similar analyses on both single and two-cell laboratory ponds. When the ponds were operated at standard loading rates and treated with kerosene at levels up to 100 gal per acre they achieved, somewhat reduced, but satisfactory levels of BOD satisfaction (73%). When operated under identical conditions of organic loading, detention time, depth and light, two-cell ponds compared to their one-cell counterparts achieved and maintained high reductions in BOD which was due in part to a reduction in the concentration of effluent algae. (Author abstract by permission, modified, Copies of the thesis are available from University Microfilms, order No. 71-27,640).

72-0331. Anonymous. **Controversy continues over PCB's.** *Chem. Eng. News 49(51): 32-33; 1971.* (1 reference)

Studies linking birth defects in birds to polychlorinated biphenyls (PCB's) in the environment are reviewed. On Long Island Sound a high incidence of deformities was observed in terns with flesh PCB concentrations of 5-175 ppm. Lipids of both viable and overdue osprey eggs obtained from the shore of the sound had PCB levels from 545-2270 ppm. Strong evidence of chromosomal damage was found in ring doves fed food containing 10 ppm PCB. Despite these studies, a definite cause-effect relationship between PCB's and birth defects remains to be established. Manufacturer-sponsored tests indicate only minimal effects in animals from PCB's.

72-0332. Goulding, R. (Guy's Hospital, Poisons Unit, London, England). **Contamination in countryside and home.** *J. Roy. Coll. Physicians 5(4): 374-78; 1971.* (9 references)

An acute overdose can manifest the toxicity of the organochlorine insecticides by causing stimulation of the central nervous system and epileptiform seizures. Chemically and biologically this group of chemicals is inordinately stable. This tendency is an advantage to the insecticide but a disadvantage to man because the insecticide is transferred through the food chain from

flora to fauna and lastly it aggregates in carnivorous species. The use of organic mercury compounds has greatly increased and in Japan it has caused an outbreak of organic mercury poisoning. Organic arsenic compounds are used to promote growth in livestock and thus increase an environmental accumulation.

72-0333. Kennedy, M. V.; Stojanovic, B. J.; Shuman, Jr., F. L. (Mississippi State Univ., State College, MS 39762). **Chemical and thermal aspects of pesticide disposal.** *J. Environ. Quality 1(1): 63-65; 1972.*

Twenty different pesticidal compounds (e.g. DDT, dieldrin, malathion) were selected to find possible methods for their disposal. Sodium biphenyl reagent treated pesticides decomposed 80 to 99%. Upon treatment by a mixture of liquid ammonia and metallic sodium, 15 of the 19 compounds were totally decomposed; metallic lithium was not as effective as sodium, decomposing only eight of the 19 compounds. These alkali metal-liquid ammonia mixtures are very effective but highly dangerous to use and the decomposed product of the pesticides was not tested for toxicity. One method found quite effective was the incineration of the compounds at 900°C, which destroyed all of the 20 compounds tested; however, four dangerous gases (chlorine, nitric acid, hydrogen chloride, hydrogen sulfide) were identified as the volatile products.

72-0334. Wall, Jr., W. J.; Marganian, V. M. (Bridgewater State Coll., Bridgewater, MA). **Control of *Culicoides Melleus* (COQ.) (Diptera: *Ceratopogonidae*) with granular organophosphorus pesticides, and the direct effect on other fauna.** *Mosquito News 31(2): 209-214; 1971.* (2 references)

Results are reported for field tests using granular organophosphorus pesticides to control *Culicoides melleus* in 0.04- and 0.12-acre intertidal sand plots. The 0.04-acre experiments indicated that Baytex (fenthion), Dursban, Abate (sand formulation), and Diazinon applied at low concentrations effectively killed *C. melleus* larvae without appreciably reducing other intertidal fauna in the treated area. Numerous collembolans were killed by Baytex, Dursban, and Diazinon and numerous silversides by Diazinon applied at 0.2 pound/acre. Malathion was somewhat effective as a larvicide, but Bay 77488 and Bay 78182 were ineffective. Dursban applied to 0.12-acre intertidal sand plots at 0.2 pound/acre provided good *C. melleus* control but killed numerous *Fundulus spp.* (killifish), *Uca. spp.* (fiddler crabs), and collembolans. Applied at 0.05 pound/acre, Dursban effectively reduced *Culicoides* larvae and was not toxic to fiddler crabs or other organisms. Abate applied at 0.4 pound/acre provided excellent larvae control, but killed numerous fiddler crabs; Diazinon applied at 0.2 pound/acre was also an effective larvicide but toxic to enchytraids, naidids, collembolans, and dolichopodid larvae. Repopulation of Diazinon-treated plots by *C. melleus* occurred the second week following treatment. None of the tested pesticides appeared to directly affect bivalves or plankton.

72-0335. Hueper, W. C. (4558 McGregor Blvd., Fort Myers, FL 33901). **Public health hazards from environmental chemical carcinogens, mutagens and teratogens.** *Health Phys. 21(5): 689-707; 1971.* (99 references)

The two prime segments of the human environmental spectrum of carcinogenic risks are environmental chemical cancer hazards and radiation cancer hazards. Because of the expanding contamination of the human environment with products and wastes of modern industry, the cancer hazards from both types of carcinogenic agents have been rising during the past 75 yr. The marked increase in frequency of certain cancers in many industrialized countries is due to this development. This development is also responsible for shifts in age and sex distribution of certain cancers in general or circumscribed population groups. Definite cancer risks are created when exposure to carcinogens is sustained over long periods in a carcinogenically polluted environment. This risk is great since carcinogenic effects on cells are largely irreversible, therefore persistent and cumulative when repeated. Scientifically there is no such thing as a "safe" dose for carcinogens; therefore, all carcinogens which are environmentally avoidable should be eradicated and prevented from invading the human environment. Persons who have been in contact with carcinogens should be kept under life-long medical supervision so that, if need be, precancerous and early cancerous lesions can be detected. Many carcinogens are also mutagens and teratogens and, therefore, such a policy would protect the population against these hazards associated with man-made and often avoidable dangerous products and wastes. There is a close similarity between the biologic characteristics of chemical carcinogens, mutagens and teratogens and those characteristics exhibited by carcinogenic radiation. Because of this close relationship any premise and standard found useful in controlling chemical cancer risks could also be applied for the prevention of radiation cancer hazards.

72-0336. Kontek, M.; Marcinkowska, B.; Pietraszek, Z. (Z Kliniki Chorob Wewnetrznych Instytutu Chorob Wewnetrznych AM w Poznaniu, Poznan, Poland). **Badania elektroencefalograficzne u pracownikow rolnych zawodowo narazonych na dzialanie srodkow ochrony roslin. [Electroencephalograms in farmers professionally exposed to pesticides.]** *Medycyna Pracy 22(4): 433-40; 1971.* (16 references) (Polish)

Twenty-two farmers between the ages of 22-60 who hab been employed in work with exposure to pes-

ticides for two wk to 16 yr were given an electroencephalographic examination four to six wk after their work with the pesticides had ended. Pathologic electroencephalograms were noted in six out of all patients examined (27.2%); changes at hyperventilation were revealed in six other persons (27.2%). Pseudocholinesterase activity and laboratory findings in all workers were normal. No analogy was found between time of service, time of real exposure and frequency and intensity of changes in EEG records.

72-0337. Anonymous. **Danger to farm workers from residue on leaves.** *Agr. Chem. Commer. Fert. 26(11): 21-22; 1971.*

Several cases of organophosphrous poisonings have been reported in harvest workers weeks after the spraying had taken place. At this time the levels of residue on the harvested fruit were safe for the consumer. A research was conducted by the UC Kearney Horticultural Field Station to solve this puzzle. The volunteer workers were examined prior to the harvest and their cholinesterase level checked periodically. No significant illness developed among the grape pickers, although the cholinesterase level of some of the workers dropped during the season. The cases of parathion poisoning must have been due to prolonged contact with pesticide residues (on clothes, skin) which were not on the fruit or vegetable but on the foliage where the residue level is much higher. To prevent further cases of poisoning, a better system for detecting cases of poisoning must be developed, more research on the effects of mixing pesticides must be done, and pesticides which leave much lower residue levels should be used.

See also 72-0243 72-0287 72-0295 72-0308 72-0309 72-0324 72-0341 72-0351 72-0365 72-0370

72-0338. Abernathy, C. O.; Hodgson, E.; Guthrie, F. E. (Dept. of Entomology, North Carolina State University, Raleigh, NC 27607). **Structure-activity relationship on the induction of hepatic microsomal enzymes in the mouse by 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (DDT) analogs.** *Biochem. Pharmacol. 20(9): 2385-2393; 1971.* (20 references)

The structure-activity relationships among 28 compounds structurally related to DDT with respect to induction of the microsomal mixed function oxidases in mice have been examined utilizing NADPH oxidation, cytochrome P-450 level and aniline hydroxylation as indices of mixed function oxidase activity. Eleven of these compounds stimulated the mixed function oxidase system at the dose applied (100 mg/kg, i.p.). The structural requirements for maximal induction were a halogen on each phenyl ring and three halogens on the *alpha*-position of the ethane bridge. Substitutions on the *beta*-carbon of the ethane moiety did not prevent induction, but changing substituents on the *alpha*-position greatly affected the inductive ability of the analog. The molecular dimensions, between phenyl substituents, varied from 10.0 to 11.7 A for maximal induction. The molecular dimensions between the phenyl substituent and the ethane substituents for maximal induction varied between 7.4 and 9.0 A. No correlations were found between toxicity of compounds and their inductive effects. DDE, a major metabolite of DDT and an important contaminant of animal fat, increased microsomal enzyme activity at a treatment level of 200 mg/kg, but DDD had no effect even at this level. DDA, the major water soluble metabolite of DDT, also did not induce the mixed function oxidases. (Author abstract)

72-0339. Abernathy, C. O.; Philpot, R. M; Guthrie, F. E.; Hodgson, E. (Dept. of Entomology, North Carolina State University, Raleigh, NC 27607). **Inductive effects of 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (DDT), phenobarbital, and benzpyrene on microsomal cytochrome P-450, ethyl isocyanide spectra, and metabolism *in vivo* of zoxazolamine and hexobarbital in the mouse.** *Biochem. Pharmacol. 20(9): 2395-2400; 1971.* (18 references)

Significant decreases in zoxazolamine paralysis and hexobarbital sleeping times were observed in mice following pretreatment with DDT, phenobarbital, or benzpyrene. In parallel experiments, highly significant elevations were noted in the cytochrome P-450 level and the 430 and 455 nm peaks of the ethyl isocyanide spectra of cytochrome P-450. These increases greatly exceeded those increases observed for liver wet weight and microsomal protein. No shifts in the ethyl isocyanide pH equilibrium point were noted when mice were pretreated with DDT, phenobarbital, or benzpyrene. In contrast to experiments reported on other mice, DDT appears to be non-selective inducer in the strain examined. (Author abstract)

72-0340. Litvinov, N. N.; Nikonova, A. G. (A.N. Sysin Inst. of General and Communal Hygiene, Acad. of Medical Sciences of the USSR, Moscow, USSR). **Vliyaniye Alkilsul'fata na rezorbtsiyu pestitsidov i soderzhaniye ikh v organakh podopythykh zhivotnykh. [The action of aklyl sulfate on the resorption of pesticides and on their content in animal organs.].** *Gig. Sanit. 36(9): 21-25; 1971.* (11 references)

The action of low doses of surface active substances such as alkyl sulfates on the intestinal absorption of organochlorine pesticides such as BHC and DDT in albino rats was investigated. Simultaneous intragastric administration of BHC (0.5 ml of a 0.74% solution) in 3.7 mg per rat doses and alkyl sulfate (2.5 ml in concentrations of 0.5 or 5 mg/ml) produced increased concentrations of pesticide (up to 28%) in the liver one hr following treatment. Increased pesticide levels in blood serum from experimental animals were found 24 hr following treatment. The kidneys of rats receiving 0.5 mg/l alkyl sulfate contained 2.5 fold concentrations and those of rats receiving 5 mg/l alkyl sulfate revealed 3.5 fold amounts of pesticide 48 hr following treatment. DDT (0.5 ml of an 1.6% solution) in 8 mg doses per rat administered with 0.5 mg/l of alkyl sulfate reached serum peak levels 6 hr following administration. When given with 5 mg/l of alkyl sulface, maximal blood serum levels of DDT were observed 2 hr following administration. Enhanced excretion of DDT from kidney and of both pesticides from liver, brain, and fatty tissues was observed with both concentrations of alkyl sulfate. The enhancement of both absorptive and excretory processes of pesticides by means of surface active substances administered at low concentrations constitutes an important hygienic feature which required further toxicologic investigation.

72-0341. Egyed, M. N. (Veterinary Dept. Utah State U., Logan, UT). **Experimental acute fluoroacetamide poisoning in sheep. III. Therapy.** *Refuah Vet. 28(2):70-73; 1971.* (13 references)

The therapeutic effects of acetamide and monoacetin were studied in sheep poisoned with the rodenticide fluoroacetamide (FAA). Acetamide at a dose rate of 200 mg/kg, given orally one hour after oral administration of 20 mg/kg of FAA, failed to save a sheep. Another sheep given both antidotes simultaneously also succumbed. Repeated doses of 0.4 mg/kg of monoacetin were similarly unable to save a sheep from a lethal dose of FAA, although the animal survived five hours longer than untreated animals. Neither drug reversed the occurrence of hyperglycemia, a common finding in FAA poisoning. Acetamide by itself had no ill effect on the sheep, but monoacetin caused depression and pain at the site of intramuscular injections.

72-0342. Bend, J. R.; Holder, G. M.; Protos, E.; Ryan, A. J. (Dept. of Pharmacy, Univ. of Sydney, Sydney,

Australia). **Water-soluble metabolites of carbaryl (1-naphthyl N-methylcarbamate) in mouse liver preparations and in the rat.** *Aust. J. Biol. Sci. 24:535-546; 1971.* (29 references)

Biliary and urinary metabolites of carbaryl were examined in the rat using 1-(1-14-C)naphthyl N-methylcarbamate and 1-naphthyl N-methyl-(14-C)carbamate. Metabolites formed by incubation of 1-(14-C)naphthyl N-methylcarbamate with supernatant from the centrifugation of 10,000 g of mouse liver homogenate were also examined. In each case substantial amounts of water-soluble materials present were identified as thioether amino acid conjugates. After acid treatment these conjugates had chromatographic properties consistent with identification as S-(4-hydroxy-1-naphthyl)cysteine and S-(5-hydroxyl-1-naphthyl)cysteine. Quantitative determination allowed assignment of up to 55, 15, and 24% of the metabolites in bile, urine, and liver, respectively, as compounds affording the cysteines on acid treatment. Some acid-labile conjugates of urine and bile were estimated indirectly by reverse isotope-dilution analyses.

72-0343. Post, L. C. (N.V. Philips-Duphar, 's-Graveland, the Netherlands). **Inhibition of cholinesterase by carbamates. A new kinetic approach.** *Biochim. Biophys. Acta 250(1): 121-130; 1971.* (6 references)

A mathematical model, describing the inhibition of acetylcholinesterase (acetylcholine hydrolase, EC 3.1.1.7) by carbamates in the presence of a substrate, is presented. This model was used for determining the affinity, carbamylation, and decarbamylation constants of N-hydroxypropoxur with spider mite cholinesterase, and the affinity and carbamylation constants of eserine with bovine erythrocyte cholinesterase. (Author abstract)

72-0344. Neill, D. D.; Muller, H. D.; Shutze, J. V. (Dept. of Avian Science, Colorado State U., Fort Collins, CO 80521). **Pesticide effects on the fecundity of the Gray partridge.** *Bull. Environ. Contam. Toxicol. 6(6): 546-551; 1971.* (12 references)

Gray partridges (*Perdix perdix*) were divided into two groups of 12 pairs each and studied for their responses to 3 ppm of dieldrin and 8 ppm of parathion administered in feed prior to and during the breeding season. Average egg production during the laying season for the dieldrin and parathion groups was 13.6 and 18.3 eggs/hen, respectively, compared with 17.9 for the control group. Average fertility of control, dieldrin, and parathion eggs for the season was 85.5, 83.2, and 90.0%, respectively, while hatchability of fertile eggs for the three groups was 81.8, 73.5, and 67.9%, respectively. The decline in hatchability of the dieldrin group was attributed to dieldrin and DDE residues. Parathion residues were not detected in eggs, but this group had high percentages of both early and late dead embryos possibly as a result of metabolic rate changes. While livability or growth of surviving chicks was not impaired, progressive debility of physiological fitness, particularly progeny production, is strongly indicated in these responses to pesticide ingestion at sublethal doses.

72-0345. Collins, T. F. X.; Williams, C. H. (Div. of Toxicology, Food and Drug Administration, Washington, DC). **Teratogenic studies with 2,4,5-T and 2,4-D in the hamster.** *Bull. Environ. Contam. Toxicol. 6(6): 559-567; 1971.* (7 references)

Commercial samples of 2,4,-5-trichlorophenoxyacetic acid (2,4,5-T) were feticidal and teratogenic in the golden Syrian hamster when administered orally on days 6-10 of organogenesis, and the incidence of effects increased when the 2,4,5-T samples contained 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (dioxin). Abnormalities per live litter were clearly related to dose levels of 2,4,5-T in combination with dioxin. With dioxin, the abnormalties caused by 2,4,5-T consisted chiefly of absence of eyelid and delayed head ossification. Dioxin contamination increased the level of hemorrhages in the liveborn and also produced marked edema. Terata were produced occasionally with 2,4-D and the fetal viability per litter decreased; but neither effect was clearly dose-related. Fused ribs were seen with greatest frequency among the terata produced by 2,4-D. There is a wide margin of safety between the exposure levels of 2,4,5-T permitted by registered uses existing prior to April 1970 on food crops and the levels producing teratological changes in hamsters. Since April, these uses have been cancelled so the possible 2,4,5-T hazard to humans is even less.

72-0346. Murphy, P. G.; Murphy, J. V. (Hopkins Marine Station of Stanford U., Pacific Grove, CA 93950). **Correlations between respiration and direct uptake of DDT in the mosquito fish** *Gambusia affinis. Bull. Environ. Contam. Toxicol. 6(6): 581-588, 1971.* (16 references)

The relationship between respiration rate and DDT uptake in the mosquito fish *Gambusia affinis* was investigated at 5 and 20 C. The fish were exposed for 48 hr to 658 plus or minus 3 ng of (14-C)DDT in tap water. Respiration was measured with constant flow respirometers. The experimental results are present in log–log plots of respiration rate vs body weight, DDT uptake vs body weight, and gill and body surface area vs body weight. A linear relationship is indicated between both oxygen consumption and DDT uptake and body weight. The diffusion rates of DDT and oxygen through the gills appear to be similarly affected by changes in respiration volume. As fish size decreases, the surface area-to-body weight ratio increases faster than the gill

area-to-body weight ratio. This suggests that cutaneous respiration accounts for a larger proportion of total respiration in smaller fish. If cutaneous respiration, which does not depend on opercular movement, is less temperature dependent than gill respiration, a greater proportion of cutaneous respiration may account for the lower ratio of DDT uptake to oxygen consumption observed at 5 C.

72-0347. Batterton, J. C.; Boush, G. M.; Matsumura, F. (Dept. of Entomology, U. of Wisconsin, Madison, WI 53706). **Growth response of blue-green algae to aldrin, dieldrin, endrin, and their metabolites.** *Bull. Environ. Contam. Toxicol. 6(6): 589-594; 1971.* (17 references)

Bacteria-free *Anacystis nidulans* (TX20) and *Agmenellum quadruplicatum* (PR-6) algae were tested for the effects of dieldrin, endrin, aldrin, and five corresponding metabolites on growth rate. Growth of liquid cultures at 39 C was followed colorimetrically in experiments lasting 26-30 hr. High concentrations (475 ppb, 950 ppb) of dieldrin and its metabolites produced an overall depression of growth rates. PR-6 exhibited less growth rate depression than TX20 to dieldrin, metabolite F, or photodieldrin. However, both PR-6 and TX20 were similarly affected at 950 ppb metabolite G. Mean growth rates of PR-6 demonstrated inhibition at all endrin concentrations tested, while TX20 was affected only at high concentrations. Ketoendrin was less toxic to TX20 but growth rates of PR-6 with ketoendrin were slightly higher than control cultures. Of the parent compounds tested, aldrin had the least effect on PR-6 and TX20. However, both microorganisms had slightly lower growth rates in the presence of photoaldrin. These data show that conversion processes occurring in chlorinated hydrocarbons do not necessarily represent degradation and detoxication steps.

72-0348. Dicowsky, L.; Morello, A. (Dept. of Zoology, University of Georgia, Athens, GA 30601) **Glutathione-dependent degradation of 2,2-dichlorovinyl dimethyl phosphate (DDVP) by the rat.** *Life Sci. Part II 10(18): 1031-1037; 1971.* (7 references)

Two major enzymatic pathways are shown for the degradation of 2,2-dichlorovinyl dimethyl phosphate (DDVP or Vapona) by the rat liver. 2,2-Dichlorovinyl monomethyl phosphate (desmethyl-DDVP), which is glutathione dependent, is produced by the first pathway. DDVP is metabolized to dimethyl phosphate and dichloracetaldehyde by the second pathway, and this, unlike the first, is glutathione-independent. Desmethyl-DDVP is degraded to dichloroacetaldehyde and monomethylphosphate, a process which is also glutathione-independent. The function of reduced-glutathione in the degradation of organophosphorous compounds is presented.

72-0349. Khan, M. A. (Canada Dept. of Agriculture, Research Station, Lethbridge, Alberta, Canada). **Some factors involved in systemic insecticide toxicosis: Esophageal lesions in heifers treated with coumaphos, crufomate and trichlorfon.** *Can. J. Animal Sci. 51(2): 411-417; 1971.* (13 references)

Eight heifers exposed to natural infestation with cattle grubs, *Hypoderma lineatum* (de Vill.) and *Hypoderma bovis* (L.) were treated dermally with three systemic insecticides: coumaphos, crufomate (Ruelene, O-4-(*tert.*-butyl-2-chlorophenyl) O-methyl methylphosphoramidate), or trichlorfon. The treated heifers appeared normal, but on necropsy gross lesions were seen in the esophagi and vertebral canals of all heifers except one who showed gross lesions only in the vertebral canal. The esophageal lesions consisted of acute inflammation and patches of congestion and hemorrhages in the mucosa and the muscular layers. *H. lineatum* larvae were found in the esophagus of all heifers and *H. bovis* larvae in the epidural fat. There was a positive correlation between the degree of cholinesterase inhibition in the esophageal larvae and the severity of the esophageal lesions. There was no correlation between lesion severity and number of esophageal larvae, particularly in heifers treated with trichlorfon or crufomate. Under the cholinergic effect of these fast-acting compounds, the larvae probably became hyperactive, with some leaving their usual location in the esophagus. The severe inflammatory reaction seen in the esophagus was absent in the vertebral canal. Possible reasons for the lack of clinical signs of esophagitis are discussed.

72-0350. Phillips, W. E. J.; Villeneuve, D. C.; Becking, G. C. (Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Canada). **The effects of lead ingestion of the body burden of DDT, liver vitamin A and microsomal enzyme activity in the rat.** *Bull. Environ. Contam. Toxicol. 6(6): 570-575; 1971.* (13 references)

Seventy male rats were divided into seven groups of 10 each, four of which received oral doses of *p,p'*-DDT in corn oil prior to 36- to 90-day diets of fox cubes containing 0, 100, or 200 ppm of lead (as lead acetate). The remaining groups were not pretreated with DDT prior to ingestion of lead. There was no statistically significant effect of dietary lead on *p,p'*-DDT, *p,p'*-DDD, or *p,p'*-DDE levels of adipose tissue after 36 days or 90 days of treatment. This indicates that ingestion of lead at levels as high as 200 ppm does not affect depletion of DDT and its metabolites or the ratio of metabolites to the parent compound in the adipose tissue of the rat. Lead alone or lead fed to DDT-pretreated animals had no effect on body weight gain, liver weight, pentobarbital sleeping times, liver protein content, carboxylesterase activity, or liver vitamin A levels. Since the rat lead intakes were many times the

maximum acceptable load for man, the results imply that present lead levels in food do not alter DDT metabolism or influence liver storage of vitamin A.

72-0351. Longcore, J. R.; Samson, F. B.; Whittendale, Jr., T. W. (Patuxent Wildlife Research Center, Laurel, MD). **DDE thins eggshells and lowers reproductive success of captive black ducks.** *(Bull. Environ. Contam. Toxicol. 6(6): 485-490; 1971.* (17 references)

The effect of 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene (DDE) on reproduction of North American black ducks (*Anas rubripes*) was studies by examining eggs from 14 pairs of captive ducks receiving dietary dosages of 10 ppm (dry weight) DDE, 12 pairs receiving 30 ppm, and 14 pairs receiving untreated food. Diets containing both 10 and 30 ppm DDE caused significant shell thinning and shell cracking. Eggshells from dosed ducks were 18-24% thinner at the equator than shells from undosed ducks; 28-31% thinner at the cap; and 29-38% thinner at the apex. Shell cracking average 21% from the 30 ppm group and 10% from the 10 ppm group. Only two percent of the eggs from untreated ducks were cracked. Survival of ducklings from dosed parents, in terms of percentage of 21-day ducklings of embryonated eggs, was 40-76% lower than survival of ducklings from undosed parents. Average DDE residues (wet weight) in eggs from hens fed 10 and 30 ppm DDE were 46 ppm and 144 ppm, respectively. Each egg from undosed hens had less than 0.7 ppm DDE. These results may explain the decrease in the number of black ducks along the Atlantic Coast.

72-0352. Georgacakis, E.; Chandran, S. R.; Khan, M. A. Q. (Dept. of Biological Sciences, U. of Illinois, Chicago, IL). **Toxicity-metabolism relationship of the photoisomers of cyclodiene insecticides in freshwater animals.** *Bull. Environ. Contam. Toxicol. 6(6): 535-538; 1971.* (12 references)

The residual cyclodiene insecticides aldrin, dieldrin, heptachlor, and isodrin can be converted by sunlight and ultraviolet light to their corresponding respective isomers: photoaldrin, photodieldrin, photoheptachlor, and photoisodrin. Results of a preliminary investigation of the toxicity-metabolism relationship of these photoisomers are presented for freshwater crustacea, fish, and tadpoles. The onset of toxic symptoms of photoaldrin and photodieldrin was three to five times faster than aldrin and dieldrin in crayfish, bluegills, and minnows and 1.3 to 2.2 times faster in other species. Photoisodrin was three to five times slower than isodrin in its toxic action against the animals tested. The increased toxicity of photoaldrin and photodieldrin is apparently related to the rate of *in vivo* formation of more toxic ketones. Thorough investigations of these photoisomers and their ketones in the environment and in animal food chains must be undertaken to prevent ecological hazards.

72-0353. Pardini, R. S. (Div. of Biochemistry, U. of Nevada, Reno, NV 89507). **Polychlorinated biphenyls (PCB): Effect on mitochondrial enzyme systems.** *Bull. Environ. Contam. Toxicol. 6(6): 539-545; 1971.* (18 references)

The effect of various polychlorinated biphenyls (PCBs) on heavy beef heart mitochondria (HBHM) NADH-oxidase and succinoxidase enzyme systems was manometrically determined. All PCB samples tested depressed NADH-oxidase and succinoxidase activity to below 20% of uninhibited controls. Thus degree of chlorination of PCB material between the 21-62% range is of minor structural significance in relation to electron transport inhibition. Inhibition of NADH-oxidase by all the PCBs tested was bypassed by N,N,N',N'-tetramethyl-*p*-phenylenediamine (TMPD); hence, the site of interaction of the PCBs in mitochondrial electron transport systems is on the substrate side of cytochrome c, i.e., NADH-cytochrome c reductase and succinate-cytochrome c reductase.

72-0354. Chang, F.-Y.; Smith, L. W.; Stephenson, G. R. (Dept. of Environmental Biology, Univ. of Guelph, Guelph, Ontario, Canada). **Insecticide inhibition of herbicide metabolism in leaf tissues.** *J. Agr. Food Chem. 19(6): 1183-1186; 1971.* (18 references)

The effects of eight insecticides on the metabolism of nine herbicides were investigated in isolated leaf tissues of plants. About half of the 72 herbicide-insecticide combinations showed some degree of interaction. The metabolism of 3,6-dichloro-*o*-anisic acid (dicamba), isopropyl *m*-chlorocarbanilate (chlorpropham), and 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (linuron) in wheat, bean, and plantain, respectively, was commonly inhibited by organophosphate insecticides. 3,4-Dichloropropionanilide (propanil) metabolism in tomato was strongly inhibited by all the insecticides examined, especially the carbamates. The metabolism of 5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone (pyrazon) in red beet and N-(1,1-dimethylpropynyl)-3,5-dichlorobenzamide (Kerb) in lettuce was inhibited by some of the carbamates and some of the organophosphates. No insecticides significantly inhibited the metabolism of 3-amino-2,5-dichlorobenzoic acid (chloramben), 3-amino-*s*-triazole (amitrole), or 4-(2,4-dichlorophenoxy)butyric acid (2,4-DB) in bean. (Author abstract reprinted by permission of the American Chemical Society)

72-0355. Chang, F.-Y.; Stephenson, G. R.; Smith, L. W. (Dept. of Environmental Biology, University of Guelph,

Guelph, Ontario, Canada). **Influence of herbicides in insecticide metabolism in leaf tissues.** *J. Agr. Food Chem. 19(6): 1187-1190; 1971.* (18 references)

The influence of six herbicides on the metabolism of the insecticides 1-naphthyl methylcarbamate (carbaryl), O-ethyl S-phenyl ethylphosphonodithioate (Dyfonate), and diethyl mercaptosuccinate S ester with O,O-dimethyl phosphorodithioate (malathion), was studied in leaf discs of tomato or bean. The herbicides 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (linuron) and 3',4'-dichloropropionanilide (propanil) inhibited the metabolism of Dyfonate and malathion in bean tissue, while carbaryl metabolism in tomato was inhibited by linuron but stimulated by isopropyl *m*-chlorocarbanilate (chlorpropham). Propanil did not inhibit the overall rate of disappearance of the carbaryl but did inhibit the conversion of one metabolite of carbaryl to another. 3,6-dichloro-*o*-anisic acid (dicamba), 5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone (pyrazon) and N-(1,1-dimethylpropynyl)-3,5-dichlorobenzamide (Kerb) did not effect the metabolism of the three insecticides. (Author abstract reprinted by permission of the American Chemical Society)

72-0356. Williams, P. P.; Feil, V. J. (U.S. Dept. of Agriculture, Animal Science Research Division, ARS, Metabolism and Radiation Research Laboratory, Fargo, ND 58102). **Identification of trifluralin metabolites from rumen microbial cultures. Effect of trifluralin on bacteria and protoza.** *J. Agr. Food Chem. 19(6): 1198-1204; 1971.* (11 references)

Bacteroides ruminicola subsp. *brevis* (GA-33) and *Lachnospira multiparus* (D-32) degraded C-14-trifluralin (*alpha,alpha,alpha*-trifluoro-2,6-dinitro-N,N-dipropyl-*p*-toluidine) to *alpha,alpha,alpha*-trifluoro-N4,N4-dipropyltoluene-3,4,5-triamine, *alpha,alpha,alpha*-trifluoro-5-nitro-N4-propyltoluene-3,4-diamine, *alpha,alpha,alpha*-trifluoro-N4,N4-dipropyl-5-nitrotoluene-3,4-diamine, *alpha,alpha,alpha*-trifluoro-N4-propyltoluene-3,4,5-triamine, *alpha,alpha,alpha*-trifluoro-2,6-dinitro-N-propyl-*p*-toluidine, and polar products. Metabolites were identified by spectral comparison with authentic compounds. No loss of the trifluoromethyl group or cleavage of the ring of trifluralin was evident. Rumen bacteria were etiological agents found to degrade trifluralin in rumen fluid. However, of 12 characterized rumen bacterial strains, 10 did not degrade trifluralin. Based on endogenous gas evolved, volatile fatty acid production, viable population counts, and microscopic observations, rumen ciliated protozoa and bacteria tolerated relatively high concentrations of trifluralin. (Author abstract reprinted by permission of the American Chemical Society)

72-0357. Locke. R. K.; Bastone, V. B.; Baron, R. L. (Division of Pesticide Chemistry and Toxicology, Food and Drug Administration, Department of Health, Education and Welfare, Washington, D.C. 20204). **Studies of carbamate pesticide metabolism utilizing plant and mammalian cells in culture.** *J. Agr. Food Chem. 19(6): 1205-1209; 1971.* (16 references)

One experimental and two commerical insecticides (carbaryl, Banol and UC-34096 [N'-(4-methylcarbamoyloxy-*o*-tolyl)-N,N-dimethylformamidine] labeled with 14-C in selected positions, were introduced into the medium of human embryonic lung or tobacco cells in culture. Lung cells hydrolyzed the Banol to the phenol, which was then conjugated as an O-glucuronide. UC-34096 was not metabolized by lung cells, but formed a spontaneous decomposition product. Tobacco cells in suspension culture incorporated 21% of the added carbaryl. A significant amount of the incorporated label was associated with cell debris following homogenization. The remaining label contained in the supernatant fraction consisted of an unidentified organoextractable metabolite, neutral conjugates of carbaryl, *alpha*-naphthol, and 5,6-dihydro-5,6-dihydroxycarbaryl, and acidic conjugates of carbaryl and *alpha*-naphthol. (Author abstract reprinted by permission of the American Chemical Society)

72-0358. Matthews, H. B.; Mc Kinney, J. D.; Lucier, G. W. (National Institute of Environmental Health Sciences, National Institute of Health, Public Health Service and Dept. of Health, Education, and Welfare, Research Triangle Park, NC 27709). **Dieldrin metabolism, excretion, and storage in male and female rats.** *J. Agr. Food Chem. 19(6): 1244-1248; 1971.* (15 references)

The metabolism, excretion, and storage of a some of dieldrin such as might result from an environmental exposure was studied by feeding male and female rats 10 ppm of dieldrin-14-C in 3g of their regular diet. The feces and urine were collected for nine days. The rats were sacrificed, and the major organs and tissues were analyzed for radioactivity. The sexes differed in the rate in which they excreted the radioactivity in the feces, in the nature of the metabolites excreted in the urine, and in the amount of dieldrin stored in the tissues. The radioactivity extracted from the tissues of the female rats were primarily dieldrin, whereas that extracted from the tissues of the males consisted of varying amounts of Klein's metabolite, (2-keto derivative), depending upon the tissues. The major metabolite of dieldrin is excreted in the feces and has been shown to be rapidly conjugated with glucuronic acid *in vitro* by microsomal enzymes from the livers of both sexes. (Author abstract reprinted by permission of the American Chemical Society)

72-0359. Lucier, G. W.; Menzer, R. E. (Cell Biology Branch, National Institute of Environmental Health Sciences, Research Triangle, NC 27709). **Nature of neutral**

phosphorus ester metabolites of phosphamidon formed in rats and liver microsomes. *J. Agr. Food Chem. 19(6): 1249-1255; 1971.* (18 references)

Phosphamidon underwent complete oxidative N-deethylation in rats *in vivo* coupled with the formation of N-hydroxyethyl intermediates. Phosphamidon, its mono-N-ethylamide analog, and the unsubstituted amide analog were also apparently dechlorinated to form vinyl hydroxy compounds. The major neutral phosphate ester metabolite of phosphamidon in rats was its unsubstituted amide derivative. Rats deactivated phosphamidon very rapidly with most of the radioactivity excreted as innocuous hydrolysis products. Rabbit and rat liver microsomes fortified with NADPH N-deethylated phosphamidon, although the N-hydroxyethyl intermediates were not detected. Microsomal oxidation of phosphamidon *in vitro* was not enhanced by *in vivo* pretreatment of animals with sodium phenobarbital. (Author abstract reprinted by permission of the American Chemical Society)

72-0360. Gutenmann, W. H.; St. John, Jr., L. E.; Lisk, D. J. (Pesticide Residue Laboratory, Dept. of Entomology, Cornell University, Ithaca, NY 14850). **Metabolic studies with Gardona insecticide in the dairy cow.** *J. Agr. Food Chem. 19(6): 1259-1260; 1971.* (4 references)

A feeding experiment was conducted to study the metabolism and excretion of Gardona, 2-chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate, insecticide in the dairy cow. At an insecticide level of 5 ppm in the daily ration, no residues of Gardona were found in milk or urine. A metabolite was found in hydrolyzed urine with a retention time identical to 1-(2,4,5-trichlorophenyl)ethanol. It corresponded to about 75.7% of the total Gardona fed. In the presence of beef liver 10,000 times *g* supernate, Gardona completely disappeared with production of a metabolite again with the retention time of 1-(2,4,5-trichlorophenyl)ethanol. About 0.6% of the total dose was found as the intact compound in feces. 2,4,5-Trichloroacetophenone, a possible metabolite of Gardona, was not detected in milk, urine, or feces. Gardona was stable when incubated with rumen fluid. (Author abstract reprinted by permission of the American Chemical Society)

72-0361. Jakl, A.; Tulach J. (Medizinischer Forschungsinstitut J. E. Purkyne, Hradec Kralove, Czechoslovakia). **Therapeutische Wirksamkeit von Esterase-Reaktivatoren bei der Vergiftung mit Organophosphaten und ihre Grenzen. [The therapeutic effect of cholinesterase reactivators during poisoning by organophosphates and its limits.]** *Sb. Ved. Pr. Lek. Fak. Karlove Univ. Hradci Karlove 14(2): 153-63; 1971.* (17 references) (German)

The aging of acetylcholinesterase (AChE) and the distribution of the noxa were studied with two compounds: O-pinacolyl-methyl-fluorophosphamate (PMFP) and O-ethyl-S-2-dimethylaminoethyl-methylthiophosphamate (EDEMS). In Wistar rats, AChE reactivation was inversely proportional to the dose of PMFP. With EDEMS, AChE reactivation was maintained even with dose causing 100% mortality. Intravenous injections of PMFP caused faster AChE aging than intramuscular injections. AChE activity was not as greatly affected in the diaphragm as in the brain, due to the quick penetration of the blood-brain barrier by PMFP. In the brain, the effect of the antidote therapy decreased with the increased doses of the organophosphates and reached the level of the control group with higher doses. In the diaphragm, the antidote combinations had a negative effect; AChE activity was lower than in the control group.

72-0362. Pearl, W.; Kupfer, D. (Lederle Laboratories, Division of American Cyanamid Company Pearl River, N.Y. 10965). **Stimulation of dieldrin elimination by a thiouracil derivative and DDT in the rat; enhancement of dieldrin oxidative metabolism?** *Chem.-Biol. Interactions 4(2): 91-96; 1971-72.* (12 references)

The elimination of intraperitoneally administered [14-C] dieldrin in rats was enhanced by oral treatment with either DDT or 1-benzyl-2-thio-5,6-dihydrouracil (BTDU). Urinary elmination of [14-C] dieldrin was increased several times in rats treated with DDT and BTDU. The increase in elimination of [14-C] dieldrin in the feces, however, was not as pronounced. The activity of the hepatic oxidative "drug-metabolizing enzymes" is stimulated by DDT and BTDU. DDT and BTDU treatments reduced the duration of hexobarbital- and progesterone-induced sleep. It is implied that by stimulating the rats oxidative metabolism, DDT and BTDU increase the elimination of dieldrin.

72-0363. Cloutier, G.; Gascon, A. L. (Department of Pharmacology, Faculty of Medicine, Univ. of Montreal, Montreal, Quebec, Canada). **Modification of catecholamine content of male accessory sexual tissues of guinea pig after pretreatment with microsomal enzyme inducers.** *Biochem. Pharmacol. 20(9): 2319-2325; 1971.* (17 references)

Recently, it was found that pretreatment of the guinea pig with phenobarbital increases the reactivity of the isolated seminal vesicle to indirect sympathomimetic agents. This was interpreted as either a direct effect on noradrenaline synthesis or an indirect effect via the acceleration of the biotransformation of endogenous steroids. To test these hypotheses, we studied the effect of phenobarbital, 3-methylcholanthrene, and DDT on the catecholamine content of various tissues of adult, castrated, and immature guinea pigs. The results

show that phenobarbital, 3-methylcholanthrene, and DDT increase the noradrenoline content of the accessory sexual tissues, an effect that is not dependent on the hormonal state of the animals. It is suggested that microsomal enzyme inducers act locally to increase the synthesis of noradrenaline in terminal nerve endings. However, the possiblity of an indirect action of phenobarbital via the adrenal gland remains to be verified. (Author abstract by permission, modified)

72-0364. Trabka, J.; Feledyk, K.; Stach, R. (Dept. of Pharmacology, Polish Academy of Sciences, Cracow, Poland). **The influence of sodium diethyldithiocarbamate on behavior and EEG in cats and rabbits.** *Arch. Immunol. Ther. Exp. 19(4): 567-576; 1971.* (14 references)

Fifty rabbits and 25 cats were studied for the influence of sodium diethyldithiocarbamate (DEDTC) and disulfiram (DS) on their behavior and brain bioelectric activity. In cats, DEDTC was injected intraperitoneally in doses of 50 or 100 mg/kg body weight and intravenously in doses of 0.5 and 1.0 mg. In rabbits, water-soluble disulfiram was introduced into the stomach in doses of 100 and 150 mg/kg and DEDTC injected intravenously in doses of 50, 75, and 100 mg/kg. Spontaneous and compulsory behavior and resting and induced cerebral bioelectric activity were observed. Decreased spontaneous motility and atactic-dysmetric disorders occured in cats after intraventricular injection of DEDTC in both doses. Behavioral changes were the same after intraperitoneal injection, although less pronounced and lasting 20 min longer. EEG changes were identical for both routes of administration; five to 12 min after administration, generalized desynchronization was manifested by flat courses of bioelectric activity, disappearance of free waves, and appearance of fast rhythms. In rabbits DEDTC distinctly increased the alert pattern of cerebral resting bioelectric activity and arousal reaction. Both DEDTC and DS lowered threshold sensitivity of limbic structures. The observed phenomena may be a result of inactivation of dopamine Beta-hydroxylase by DEDTC, leading to disturbed levels of catecholamines.

72-0365. Radomski, J. L.; Deichmann, W. B.; Rey, A. A.; Merkin, T. (Dept. of Pharmacology and the Research and Teaching Centre of Toxicology, Univ. of Miama School of Medicine, Miama, FL 33152). **Human pesticide blood levels as a measure of body burden and pesticide exposure.** *Toxicol. Appl. Pharmacol. 20(2): 175-185; 1971.* (6 references)

Studied have been conducted on the variability and utility of whole blood and plasma organochlorine pesticide concentration measurements in man. Concentrations of *p,p'*-DDE, dieldrin, and *beta*-hexachlorocyclohexane (*beta*-BHC) are remarkably consistent throughout the day. Minor increases in *p,p'*DDT and *p,p'*-DDT serum concentrations were observed promptly following the ingestion of the evening meal. In random autopsy specimens, good correlations were found between blood and fat concentrations of *p,p'*DDE, *p,p'*DDT, (*beta*-BHC). The concentrations of these insecticides in plasma, when measured in five individuals repeatedly throughout a work week, were also remarkably consistent. Plasma pesticide measurements are preferred to whole blood measurements. Compared to United States residents, markedly elevated blood concentrations of *beta*-BHC were observed in graduate students and postdoctoral fellows who had come from Formosa and Japan. Apparently, concentrations of organochlorine pesticides in the blood are in equilibrium with those in the tissue and measurement constitutes a highly useful and readily obtainable means of estimating body burdens and exposure. (Author abstract by permission)

72-0366. Vos. J. G.; Strik, J. J. T. W. A.; van Holsteyn, C. W. M.; Pennings, J. H. (Institute of Veterinary Pharmacology and Toxicology, Univ. of Utrecht, Biltstraat 172, Utrecht, The Netherlands). **Polychlorinated biphenyls as inducers of hepatic porphyria in Japanese quail, with special references to *delta*-aminolevulinic acid synthetase activity, fluorescence, and residues in the liver.** *Toxicol. Appl. Pharmacol. 20(2): 232-40; 1971.* (30 references)

Male Japanese quail were orally dosed, daily for seven days, with 1000, 500, 250, 100, 50, and 0 mg PCB (Aroclor 1260) per kg body weight. The birds receiving 1000 mg/kg died. A dose-related increase in liver and liver:body weight ratio was found. Macroscopic and microscopic examination under ultraviolet light were used for the detection of porphyrin fluorescence. Mitochondrial ALA synthetase activity demonstrated a large increase (20-fold at the 500 mg/kg level; 10-fold at the 50 mg/kg level). The doubling of mitochondrial protein, the increase of ALA synthetase activity, the liver enlargement, and the pyroninophilic staining of the hepatic nucleoli suggest an increased protein synthesis. In a second experiment, five groups of female quail received 100, 10, 1, 0.1, and 0 mg PCB per kg body weight. ALA synthetase activity was increased about 20-fold in the 100 mg/kg group. This increase, together with the high PCB content of the livers (mean 478 ppm) and the incidence of fluorescence, indicating porphyrins, were correlated with the loss of weight in this group (mean 8%). Mobilization of PCB from storage fat is considered to be responsible for the increased porphyria. The dose-response relationship and liver residue relationship of PCB and ALA synthetase activity are given. (Author abstract by permission)

72-0367. Su, M.-Q.; Kinoshita, F. K.; Frawley, J. P.; Dubois, K. P. (Dept. of Pharmacology, Northwestern Univ. Medical School, Chicago, IL 60637). **Comparative inhibition of aliesterases and cholinesterase in rats fed 18 organophosphorus insecticides.** *Toxicol. Appl. Pharmacol. 20(2): 241-49; 1971.* (7 references)

Eighteen organophosphorus insecticides were fed to 30-day-old female rats for one week at various dietary levels. Measurements were made of the inhibitory effects of the insecticides on aliesterases of serum and liver using diethylsuccinate and tributyrin as substrates. The cholinesterase activity of liver, serum, and brains of rats that received the same levels of the insecticides was also measured. Dose-related decreases in aliesterase activity were obtained with the appropriate dietary levels of each compound. The aliesterase activity of liver was more sensitive to inhibition than serum. The hydrolysis of tributyrin was inhibited at lower dietary levels than the hydrolysis of diethylsuccinate by liver, but hydrolysis of the two substrates by serum was affected to essentially the same extent. In most cases the dietary levels required to inhibit cholinesterase were considerably higher than the levels that inhibited aliesterase. When the aliesterase activity was depressed by feeding various levels of organophosphorus insecticides for one week, the amount of potentiation of the toxicity of malathion was closely related to the amount of inhibition of liver aliesterases regardless of which compound was fed. (Author abstract by permission)

72-0368. Wrich, M.J. (South Dakota State University, Brookings, SD). **The influence of various stress conditions of chlorinesterase levels of cattle treated with an organophosphorus insecticide.** *Diss. Abstr. Int. 32(5): 2779-80; 1971.*

Six- to 8-months-old Hereford heifers were used for this research. Specified groups of calves were subjected to 30 minutes of continuous exercise or the withholding of feed and water for 24 hours prior to treatment with a pour-on formulation of fenthion. The exercise and ration abstinence simulated stress conditions common to many livestock regions. Pretreatment and posttreatment jugular vein samples were evaluated to determine the effects of stress and fenthion on blood cholinesterase (ChE). According to statistical analysis, exercise and feed and water abstinence had little influence on ChE levels. Insecticide treatment produced the most consistent and significant variations in ChE. Fluctuations in ChE levels suggest that fenthion absorption occurs within 24 to 48 hours following treatment. Generally, insecticide influence was apparent throughout each of the four research phases in 1968 and 1969. Animal toxicosis was minimal throughout this study. One calf did display typical subacute organophosphate side effects. (Author abstract by permission, edited copies of the thesis are available from University Microfilms, order No. 71-28,503)

72-0369. Carter, F. L. (The Louisiana State University and Agricultural and Mechanical College, Baton Rouge, LA 70803). *In vivo* **studies of brain acetylcholinesterase inhibition by organophosphate and carbamate insecticides in fish.** *Diss. Abstr. 32(5): 27, 2-73; 1971.*

Sublethal effects of ten selected organophosphate and carbamate insecticides of channel catfish, *Ictalurus punctatus,* were investigated to determine acetylcholinesterase (AChE) inhibition potency and recovery characteristics, and relationships of AChE inhibition to exposure time, concentration and symptom appearance. Acute toxicity (24 hr LC50's) of the test insecticides to channel catfish were (in ppm): Dursban (0.16), methomyl (0.92), aldicarb (1.6), carbofuran (2.03), azirphosmethyl (3.9), methyl parathion (9.36), malathion (10.0), carbaryl (11.5), dicrotophos (13.0) and monocrotophos (70.4). Channel catfish were subjected to sublethal exposure of each insecticide to determine potency of brain AChE inhibition and inhibited enzyme recovery rates. AChE inhibition potencies (in ppm estimated to effect 50% inhibition with static exposure conditions) were: Dursban (0.009), methomyl (0.016), carbofuran (0.19), azinphosmethyl (0.5), aldicarb (0.315), dicrotophos (1.0), methyl parathion (1.05), malathion (1.8), carbaryl .0), and monocrotophos (5.0). Brain AChE inhibited 80-90% by carbamates recovered (under static pool conditions) to 80% of the normal activity in 6-10 days (with methomyl and aldicarb). Comparative rates for organophosphates were: methyl parathion (20 to 30 days), malathion (10 to 40 days), dicrotophos (13 to 22), azinphosmethyl (35), and Dursban (48). AChE recovery rates were generally more rapid, with exception of methomyl, methylparathion, and malathion, when pool treated fish were removed to insecticide-free water in aquaria than those in fish remaining in pool treatment water. Scoliosis, a lateral curvature of the spine, usually with localized hemorrhaging, was effected in channel catfish by all 10 insecticides at sublethal concentrations. Calcium deposition and fusion of two to four vertebrae were observed in fish vertebral columns nine months post-treatment. Carbamates rapidly effected maximum inhibition (in 2 hr) which was then maintained until recovery began. Organophosphates effected maximum inhibition in 2-8 hr (malathion) to 168 hr (monocrotophos). Increased inhibition by all insecticides was observed to be positively related to toxicant concentration and, especially in the organophosphates, time of exposure. Sequential toxication symptoms and associated inhibition ranges were: hyperactivity (35-70%), lethargy (66-80%), body paralysis (65-86%), scoliosis (62-89%), loss of equilibrium (78-92%), opercular and mouth paralysis with ensuing death (50-95% maximum but usual range 65-85%). Fish brain AChE has potential for utilization as a monitor for organophosphate and carbamate insecticides pending perfection of techniques and elucidation of variables. (Author abstract by permission, modified,

copies of the thesis are available from University Microfilms, order No. 71-29,350).

72-0370. Lowe, J. I.; Wilson, P. D.; Wilson, Jr., A. J. (Environmental Protection Agency, Gulf Breeze Lab., Gulf Breeze, FL) **Chronic exposure of oysters to DDT, toxaphene and parathion.** *Proc. Nat. Shellfish Ass. 61: 71-79; 1971.* (10 references)

A study was performed where oysters (*Crassostrea virginica*) were grown from juvenile to sexual maturity in flowing seawater constantly polluted with 3.0 ppb or less of DDT, toxaphene and parathion. The insecticides were administered over a period of two years in two phases; a mixture of insecticides was fed during the first phase and separate in the second. After nine months the weight of the oysters, which were fed the mixture (1.0 ppb each), was 10% less than control oysters. The oysters reared in seawater containing 1.0 ppb of DDT, toxaphene, or parathion were weighed and there was no significant difference from controls. There was a change in tissue of the kidney, visceral ganglion, gills, digestive tubules and tissues beneath the gut in oysters reared in the insecticide mixture. The presence of a mycelial fungus indicated the breakdown of the oyster's natural defense against this parasite. The amount of DDT and toxaphene accumulation was high but was eliminated by the oysters during a three month depuration period.

72-0371. Adler, I. D.; Ramarao, G.; Epstein, S. S. (Laboratories of Environmental Toxicology and Carcinogenesis, Children's Cancer Research Foundation, and Dept. of Pathology, Harvard Medical School, Boston, MA). **_In vivo_ cytogenetic effects of trimethylphosphate and of TEPA on bone marrow cells of male rats.** *Mutat. Res. 13(3): 263-73; 1971.* (51 references)

Following single and repeated intraperitoneal administration of each drug, the cytogenic effects of trimethylphosphate (TMP) and tris(2-methyl-l-aziridinyl) phosphine oxide (TEPA) on rat bone marrow cells *in vivo* were examined. Following administration of TEPA and TMP 24 and 48 hr, respectively, dose-related chromatid aberrations, including open breaks and reunion figures, were maximal. The highest dose of TMP, 2000 mg/kg, induced cytogenic damage which was less severe than that induced by the highest dose of TEPA, 10 mg/kg; the proportion of the surviving cells was greater with TMP than with TEPA. Based on this data, TMP seems to pose a greater potential genetic hazard than TEPA.

72-0372. Desi, I.; Simon, G.; Csieleszky, V. (The DDD-Division of the State Institute for Hygiene, IX. Gyali-u 2-6, Budapest, Hungary). **Untersuchung der neurotoxischen Wirkungen des Phosphatesters Bromophos. [An investigation of the neurotoxic effects of the phosphate ester, bromophos.]** *Int. Arch. Arbeitsmed. 28(3): 203-222; 1971.* (26 references) (German)

The learning process and electrical brain activity were studied in rats receiving 500, 100, 30, and 10 ppm doses of bromophos in their standard diet for 6 weeks, and after returning to a normal regimen for another 3 weeks. In labyrinth experiments, high bromophos doses had a positive effect on the learning capability only initially. With the smaller bromophos doses, the shorter learning time span outweighed learning inhibition. Deviations of conditioned reflexes were proportional to the dose. In resting rats, bromophos increased the brain activity of the 100 ppm group, but lowered that of the 500 ppm group after 17 days until the last week of the experiment. The rats were not significantly affected in experiments measuring light sensitivity. Cholinesterase activity was significantly less in the brain in only the 500 ppm group and in the blood in both high dose groups. EEG studies were recommended to determine intoxication in cases of uncertainty.

72-0373. Mestitzova, M.; Kovac, J.; Durcek, K. (Research Institute for Industrial Hygiene and Occupational Diseases, Dukelska 18-20, Bratislava, Czechoslovakia). **Metabolische Studie bei kombinierter Anwendung von Pesticiden. [A study of metabolism during combined administration of pesticides.]** *Int. Arch. Arbeitsmed. 28(3): 223-38; 1971.* (56 references) (German)

Wistar rats were pretreated with 5 mg/kg of heptachlor for 2-3 months prior to the administration of fenitrothion. The mortality of the pretreated rats was higher with fenitrothion doses less than LD50 but less with doses greater than LD50, in comparison with the control group. The pretreated rats had a higher content of fenitrooxons in the liver and blood, and a higher content of *p*-nitro-*m*-cresol (PNMC) in the urine. The large amount of PNMC in the liver homogenate indicated an increased microsomal enzyme activity. Acetylcholinesterase inhibition was not significant at first, but increased greatly within an hour after the administration of fenitrothion. AChE inhibition was greater in the liver than in the blood.

72-0374. Adamczyk E. (Dept. of Hygiene of Animal Products at the Faculty of Veterinary, Wrocaw, Poland). **Przypadek dwuletniego zalegania DDT w organizmie kury. [The case of a 2-year retention of DDT in the body of a hen.]** *Med. Wet. 27(5): 300; 1971.* (10 references) (Polish)

The purpose of the research was to continue the investigation concerning the level and form of retention of various insecticides, especially DDT and DDE, by warm-blooded animals. Previous tests have already established the important role played by such factors as

the quantity and dosis of the toxic substance, metabolism, and stress elements (for example, sickness or hunger). The described experiments, which involved feeding of hens a special mixture for two years, showed a concentration of the DDT and DDE in the reserve fat, but not in the muscles or liver. It is also stressed that these chemicals can be blocked in the reserve fat for as long as the animal does not have to cover its daily food requirements from it.

72-0375. Howells, D. J.; Coult, D. B. (Chemistry Division Chemical Defence Establishment, Porton Down, Salisbury, Wiltshire, Great Britain). **Ions of the rare earths as possible reactivators of acetylcholinesterase inhibited by some organophosphorus compounds.** *Biochim. Biophys. Acta. 244(2): 427-31; 1971.* (15 references)

The reactivation of 'aged' phosphonylated acetylcholinesterase (AChE) may form the basis for a therapy for poisoning by certain organophosphorus compounds. Since it is known that rare earth metal ions catalyze the hydrolysis of *p*-nitrophenyl hydrogen methylphosphonate–a simple model compound for the 'aged' enzyme–it was considered of interest to investigate the possibility that rare earth metal ions might reactivate the 'aged' inhibited enzyme itself. Studies of the effects of rare earth metal ions on AChE indicated that they were reversible competitive inhibitors of the enzyme. Using two criteria of reaction, namely, the reappearance of enzyme activity and the release of [^{32}P] phosphonate, it was shown that the rare earth metal ions did not catalyze the dephosphonylation of organophosphorus-inhibited AChE. The reasons for the lack of reaction are discussed briefly and it is concluded that studies with rare earth metal ions are unlikely to lead to a new therapy for poisoning by organophosphates. (Author abstract by permission)

72-0376. Cutkomp, L. K.; Yap, H. H.; Cheng, E. Y.; Koch, R. B. (Department of Entomology, Fisheries and Wildlife, University of Minnesota, St. Paul, MN 55101). **ATPase activity in fish tissue homogenates and inhibitory effects of DDT and related compounds.** *Chem-Biol. Interactions 3(6): 439-47; 1971.* (23 references)

Specific activities of Na+-K+ ATPase and Mg2+ ATPase were determined in crude mitochondrial "B" fraction homogenates of Bluegill (*Lepomis macrochirus*) tissues. Greatest activity of Na+-K+ ATPase was found in brain and kidney, with specific activities of 33.0 and 46.7 respectively. Greatest Mg2+ ATPase activity was found in the muscle and kidney, with specific activities of 49.9 and 40.5. DDT and TDE caused the most significant inhibition of Mg2+ ATPase in muscle homogenates at concentrations of 2.6 *mu*M or less. At high concentrations (20.8 and 41.7), the inhibitory effect of DDE and *o,p'*-DDT was about equal to, and that of dicofol was greater than the effect of DDT. Methoxychlor and DDA showed little or no Mg2+ ATPase inhibitory effect in muscle or brain. Dicofol was the only DDT analog which had a greater inhibitory effect on Na+-K+ ATPase of the brain than on Mg2+ ATPase. When DDT and dicofol were combined, a synergistic inhibitory effect of muscle ATPase resulted. *Alpha*-chlordane, *gamma*-chlordane, aldrin and heptachlor caused significant inhibition, with values ranging from 47.3% for aldrin Na+-K+ ATPase inhibition to 68.6% for heptachlor Na+-K+ ATPase inhibition. For these compounds, the Na+-K+ ATPase inhibition was almost equal to Mg2+ ATPase inhibition. The inhibitory effect of dieldrin, heptachlor epoxide and endrin was considerably less, with values of from 10.0% for dieldrin Mg2+ ATPase inhibition to 44.9% for heptachlor epoxide inhibition of Na+-K+ ATPase.

72-0377. Fekete, M.; Kurti, M. (Research Institute for Pharmaceutical Chemistry, Budapest, 4/1, Hungary). **Psychopharmacologic effects of some cholinesterase inhibitors in comparison with imipramine.** *Psychopharmacologia 18(3): 238-48; 1970.* (35 references)

The catalepsy evoked by tetrabenazine, chlorpromazine and bulbocapnine was restrained by imipramine and physostigmine, neostigmine and dyflos (DFP). Hypermotility caused by amphetamine in mice (not conditioned rats) was intensified by imipramine and cholinesterase inhibitors. Neostigmine and physostigmine supressed the effect exerted by chlorpromazine on conditioned reflex activity. The results in reference to the effect produced by cholinesterase inhibitors on the permeability of the blood-brain barrier, and in reference to the possible import of the cholinergic affinity of imipramine on its pharmacological effects were discussed.

72-0378. Desi, I.; Szelenyi, I.; Sos, J. (Institut fuer Pathophysiologie der Semmelweis-Universitaet, Budapest, Hungary). **Einfluss von Magnesium-Orotat und Orotsaeure auf Lernprozesse gesunder und neurotoxisch geschaedigter Ratten. [The influence of magnesium orotate and orotic acid on learning processes of normal and neurotoxically injured rats.]** *Arzneim.-Forsch. 21(6): 780-785; 1971.* (14 references) (German)

Highly sensitive tests of the functional state of the central nervous system were performed to investigate the influence of orotic acid and magnesium orotate on neurotoxic damage and their toxicity on the central nervous system. It was found that neither the spontaneous vertical orientation activity nor the learning process of healthy rats in a labyrinth were interrupted by the two substances. Administration of magnesium orotate or orotic acid in animals, the nervous system of which had been stressed neurotoxically by an insecticide of the

alkyl-phenyl-carbamate type, expelled or reduced the negative reactions caused by the nerve toxin.

72-0379. Mathre, D. E. (Montana State Univ., Bozeman, MT). **Effect of carboxin on mitochondrial activities.** *Phytopathology 61(8): 902; 1971.*

The effect of carboxin on the activities of mitochondria from several fungi, pinto beans, and rat liver was tested. Low concentrations of carboxin (K*i* being 0.32 *mu*m) were used to inhibit succinate oxidation by mitochondria from the sensitive fungus, *Ustilago maydis*. The inhibition turned out to be noncompetitive. Other sources also inhibited succinate oxidation in the mitochondria but not to such a degree as in those from *U. maydis*. The oxidation of reduced nicotinamide adenine dinucleotide was only slightly affected by carboxin. Oxidative phosphorylation in the presence of succinate in tightly coupled rat liver mitochondria did not seen to be uncoupled by carboxin, but the respiratory control ratio was decreased by it. It is assumed that mitochondrial respiration at or close to the site of succinate oxidation is not inhibited by carboxin nor are the rest of the electron transport system or the coupled phosphorylation reactions greatly affected.

See also 72-0245 72-0275 72-0277 72-0281 72-0287 72-0291 72-0294 72-0307 72-0310 72-0316 72-0328 72-0381 72-0402

72-0380. Guardigli, A.; Chow, W.; Lefar, M. S. (Dept. of Analytical Chemistry, Rhodia Inc., New Brunswick, NJ 08903). **Determination of some acidic herbicides by thin-layer chromatography.** *J. Agr. Food Chem. 19(6): 1181-1182; 1971.* (5 references)

A thin-layer chromatographic (TLC) procedure for the identification and quantitation of 2,4-dichlorophenoxyacetic acid (2,4-D), 2-methoxy-3,6,-dichlorobenzoic acid (Dicamba), 2-(2-methyl-4-chlorophenoxy)propionic acid (MCPP), 4-(2,4-dichlorophenoxy)butyric acid 4-(2,4-DB), 4,6-dinitro-*o*-cresol (DNOC), and 4,6-dinitro-*o*-*sec*-butylphenol (DNBP) has been developed. After extraction and cleanup, the herbicide residues were converted to the nitro derivatives. These derivatives were then subjected to the TLC, and visualized by reducing the nitro to the amine followed by diazotization and coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. In this manner, 0.5 *mu*g of herbicide was easily detected. This afforded a sensitivity of less than or equal to 0.05 ppm in actual crop residue determination. (Author abstract reprinted by permission of the American Chemical Society)

72-0381. Mac Donald, A.; Chen. G.; Kaykaty, M.; Fellig, J. (Chemical Research Division, Hoffmann-La Roche, Inc., Nutley, NJ 07110). **Residue Analysis of ipronidazole and its metabolite at the 2 ppb level in turkey tissue.** *J. Agr. Food Chem. 19(6): 1222-1227; 1971.* (8 references)

A method for the analysis of ipronidazole (1-methyl-2-isopropyl-5-nitroimidazole) and its major metabolite from turkey tissue at the 2 ppb level is described. The initial tissue extraction with benzene is followed by silica gel column cleanup and concentration. The column eluate is divided for individual extraction procedures followed by a gas chromatographic assay using electron-capture detection specific for each compound. The following factors affecting the assay are discussed: form of the initial tissue sample, vapor pressure, extraction characteristics, chemical stability, and light stability of the two compounds. The assay methodology was evaluated using turkey muscle, skin and fat, kidney, liver, and blood with average recoveries of 75% for ipronidazole and its metabolite. Tissue clearance data show that turkeys fed a 0.00625% ipronidazole ration for 12 weeks are free of the drug and its metabolite for days after cessation of treatment. (Author abstract reprinted by permission of the American Chemical Society)

72-0382. Schultz, D. R.; Marxmiller, R. L.; Koos, B. A. (Biological Sciences Research Center, Shell Development Co., P. O. Box 4248, Modesto, CA 95352). **Residue determination of dichlorvos and related metabolites in animal tissue and fluids.** *J. Agr. Food Chem. 19(6): 1238-1243; 1971.* (8 references)

To assist in determining the fate of dichlorvos (2,2-dichlorovinyl dimethylphosphate) in animals, gas-liquid chromatographic methods have been developed for measuring residues for four possible metabolites. These organic derivatives include dichloroacetaldehyde, dichloroethanol, dichloroacetic acid, and desmethyl dichlorvos. Detection limits are about 0.05-0.10 ppm. (Author abstract reprinted by permission of the American Chemical Society.)

72-0383. Karasz, A. B.; Gantenbein, W. M. (Food Laboratory, N.Y. State Dept. of Agriculture and Markets, State Campus, Albany, NY 12226). **Gas chromatographic determination of D–D (*cis* and *trans*-1,3-dichloro-1-propene and 1,2-dichloropropane) in potatoes.** *J. Agr. Food Chem. 19(6): 1270-1271; 1971.* (3 references)

A gas chromatographic method utilizing microcoulometric detection for the determination of residues of D-D (*cis*- and *trans*-1,3-dichloro-1-propene and 1,2-dichloropropane) in potatoes is described. In the cleanup procedure, concentration of D-D from the acetone-hexane eluate from the silica gel column is effected by the addition of sodium busulfite solution. Acetone complexes with bisulfite solution. Acetone complexes with bisulfite and the small volume of hexane separating out contains the D-D and is suitable for gas-liquid chromatography. This method of concentration of the highly volatile D-D avoids the losses associated with evaporative concentration. Ten samples of potatoes grown in soils variously treated with D-D were analyzed and no residues were found by the method described. (Author abstract reprinted by permission of the American Chemical Society)

72-0384. Rankin, P. C. (Dept. of Scientific and Industrial Research, Soil Bureau, Private Bag, Lower Hutt, New Zealand). **Negative ion mass spectra of some pesticidal compounds.** *J. Ass. Offic. Anal. Chem. 54(6): 1340-1348; 1971.* (15 references)

A study of the negative ion mass spectra of a number of complex organic molecules (pesticides) was undertaken to determine what information this technique would yield for structural analysis. The simplicity of the negative ion mass spectra was a characteristic feature and the most abundant negative ions in the spectra were assumed to be similar to the stable carbanions postulated in classical organic chemistry. The simplicity of the mass spectra suggested a possible application of the technique to the identification of carbamate pesticides. (Author abstract by permission)

72-0385. Hall, E. T. (Veterinary Division, First U.S. Army Medical Laboratory, Fort George G. Meade, MD

20755). **Variations of Florisil activity: Method to increase retentive properties and improve recovery and elution patterns of insecticides.** *J. Ass. Offic. Anal. Chem. 54(6): 1349-1351; 1971.* (6 references)

The adsorptive capacity of 10 different lots of commercial Florisil (60-100 mesh) was tested by determining the recovery and elution patterns of ten chlorinated and six organophosphate insecticides. Four lots were regular grade Florisil (calcined at 1200 F) and six lots were PR grade Florisil (calcined at 1250 F). All lots were tested as received and tested after washing with hot distilled water and re-igniting at 1250 F for 2.5 hr. Results indicated a wide variation in the activity and retention properties of the untreated lots. Certain pesticides were not totally removed from the column by the respective eluants. After the washing and re-igniting treatment, all lots of the PR Florisil gave satisfactory recovery and separation in the proper eluants. The lauric acid value was used to determine the quantity of Florisil to be placed on the column. (Author abstract by permission)

72-0386. Butler, L. I.; McDonough, L. M. (Entomology Research Div., Agricultural Research Service, U.S. Dept. of Agriculture, Yakima, WA 98902) **Determination of residues of carbofuran and its toxic metabolites by electron-capture gas chromatography after derivative formation.** *J. Ass. Offic. Anal. Chem. 54(6): 1357-1360; 1971.* (5 references)

Residue of carbofuran and its toxic metabolites (3-hydroxycarbofuran and 3-ketocarbofuran) were determined in cucumbers, lettuce, potatoes, tomatoes, tomato foliage, and soil. Samples were extracted with 0.25*N* hydrochloric acid, partitioned into dichloromethane, and chromatographed on alumina. Liquid chromatography serves the dual purpose of cleaning up the sample and separating the phenols from the carbamates. The carbamate residues were then converted to trichloroacetates and determined by electron-capture GLC. Recoveries ranged from 67.2 to 139.5% with most recoveries being 80-100%. (Author abstract by permission)

72-0387. Lee, S. S.; Fang, S. C. (Dept. of Agricultural Chemistry, Oregon State University, Corvallis, OR 97330). **Conversion of monuron to ethyl-N-*p*-chlorophenyl carbamate by soxhlet extraction of plant tissue with ethanol.** *J. Ass. Offic. Anal. Chem. 54(6): 1361-1365; 1971.* (11 references)

Soxhlet extraction of plant materials with alcohol converted monuron residue to carbamate. Although this conversion will not affect the accuracy of monuron determination by the Bratton-Marshall reaction, it will undoubtedly affect the accuracy if the measurement is carried out by thin-layer or paper chromatography. Diuron, fenuron, and chloroxuron, which contain 1,1-dimethyl substitution, were also converted to the corresponding carbamates, while siduron, neburon, linuron, monomethyl monuron, monomethyl diuron, and *p*-chlorophenyl urea were not. When monuron was refluxed with other alcohols such as methanol, isopropanol, and *n*-butanol, monuron was also converted to other products. (Author abstract by permission)

72-0388. Onley, J. H.; Yip, G. (Division of Pesticide Chemistry and Toxicology, Food and Drug Administration, Washington, DC 20204). **Herbicidal carbamates: extraction, cleanup, and gas chromatographic determination by thermionic, electron capture, and flame photometric detectors.** *J. Ass. Offic. Anal. Chem. 54(6): 1366-1370; 1971.* (20 references)

Extraction, cleanup, and gas chromatographic procedures have been developed for the determination of carbamate herbicides in food crops. Each sample is extracted with ethanol or an ethanol-water mixture and then cleaned up on a MgO-cellulose column. Determinations are made by gas chromatography, using thermionic and electron-capture detectors; a flame photometric detector may also be used to quantitate and confirm those carbamates containing sulfur. Recoveries from apples, potatoes, alfalfa, corn, and soybeans at fortification levels of 0.01 to 10 ppm exceeded 80%. (Author abstract by permission)

72-0389. Howard, S. F.; Yip, G. (Division of Chemical Technology, Food and Drug Administration, Washington, DC 20204). **Stability of metallic ethylene bisdithiocarbamates in chopped kale.** *J. Ass. Offic. Anal. Chem. 54(6): 1371-1372; 1971.* (12 references)

Chipped kale samples were fortified with maneb, zineb, or Dithane M-22, a maneb formulation. Samples were stored in a freezer or refrigerator and analyzed daily for three days. Using the carbon disulfide evolution procedure, the dithiocarbamate content in the samples was determined. Zineb was more stable than maneb or Dithane M-22 in both the frozen and refrigerated state. Immediately upon mixing, there was a loss of about 10% Dithane M- 22 and 25% maneb. Freezing the samples prevented further losses. (Author abstract by permission)

72-0390. Tessari, J. D.; Spencer, D. L. (Colorado Community Pesticide Study, P. O. Box 579, Greeley, CO 80631). **Air sampling for pesticides in the human environment.** *J. Ass. Offic. Anal. Chem. 54(6): 1376-1382; 1971.* (4 references)

A simple and inexpensive method is described for the analysis of pesticides in air samples. The method involves quantitative extraction from a nylon chiffon

cloth screen which has been exposed to the atmosphere for five days, followed by cleanup with aluminum oxide and Florisil column chromatography. Recovery studies were run on a cloth screen and results for the organochlorine pesticides ranged from 86 to 100% recovery. Evidence seems to indicate that an environment containing high residue levels has a direct relationship to pesticide body burden. (Author abstract by permission)

72-0391. El-Dib, M.A. (Water Pollution Control, National Research Centre, Dokki, Cairo, Egypt). **Colorimetric determination of aniline derivatives in natural waters.** *J. Ass. Offic. Anal. Chem. 54(6): 1383-1387;* 1971. (23 references)

A rapid, direct, and sensitive colorimetric method has been proposed for the determination of aniline derivatives in surface waters. One source of these anilines is from the degradation of phenyl carbamates, phenyl ureas, and anilide herbicides. The method is based on diazotization of the primary aromatic amine and coupling with resorcinol or 1-naphthol. Hydroxy-azo dyes obtained have considerably high absorptivities, rendering the method sensitive enough to determine anilines at 0.1 ppm. The effects of pH, saline constituents of waters, coupling phenols, and substituents on color intensity are discussed. Coefficients of variation ranged between 6 and 0.5, according to the nature of aniline derivative and the amount determined. Precision of the method is greatly increased when the amount of the existent aniline ranges between 40 and 100 *mu*g. (Author abstract by permission)

72-0392. Ott, D. E.; Formica, G.; Liebig, Jr., G. F.; Eberle, D. O.; Gunther, F. A. (Dept. of Entomology, Univ. of California, Riverside, CA 92502). **Mechanized extraction and cleanup of atrazine residues in soil prior to gas chromatographic analysis.** *J. Ass. Offic. Anal. Chem. 54(6): 1388-1395; 1971.* (6 references)

Complete mechanization of extraction and cleanup steps have been developed for atrazine residues in soils for analysis by nitrogen detector gas chromatography. Manually sieved and weighed soil samples are mechanically presented at a maximum rate of six per hour to this system, which delivers cleaned-up solvent extracts of the samples at the same rate to a fraction collector. Adjustment of final solvent volume in collection vessels and gas chromatography are performed manually in the present work. Atrazine residues in soils are thus rapidly determined down to a lower limit of 0.05 ppm. (Author abstract by permission)

72-0393. Leary, J. B. (Ortho Division, Chevron Chemical Co. Richmond, CA 94804). **Gas Chromatographic determination of Monitor (O,S-dimethyl phosphoramidothioate) residues in crops.** *J. Ass. Offic. Anal. Chem. 54(6): 1396-1398; 1971.*

A gas chromatographic method is described for determining Monitor in a variety of crops. After extraction of the sample with ethyl acetate, the solvent is evaporated and an ether solution of the residue is passed through a silica gel column to remove interferences. Monitor is then eluted from the column with acetone and measured by gas chromatography, using a cesium bromide thermionic detector. The majority of standard recovery values ranged between 90 and 100% when samples were fortified at 0.05 to 0.1 ppm. (Author abstract by permission)

72-0394. Pease, H. L.; Holt, R. F. (Industrial and Biochemicals Dept., Experimental Station, E.I. du Pont de Nemours Co., Inc., Wilmington, DE 19898). **Improved method for determining benomyl residues.** *J. Ass. Offic. Anal. Chem. 54(6): 1399-1402; 1971.*

A fluorometric and colorimetric procedure for determining benomyl residues previously reported has been modified to make it less time-consuming and to now permit analyses of substrates, i.e., citrus, that could not previously be analyzed by the fluorometric method. The sensitivity of the method remains the same, about 0.1 ppm. An alternative procedure to the colorimetric method previously recommended for differentiating between benomyl and other fungicidal benzimidazoles is also described. This alternative procedure is based on fluorometric measurement from both acid and basic media. (Author abstract by permission)

72-0395. Porter, M. L.; Burke, J. A. (Div. of Chemical Technology, Food and Drug Administration, Washington, DC 20204). **Separation of three chlorodibenzo-*p*-dioxins from some polychlorinated biphenyls by chromatography on an aluminum oxide column.** *J. Ass. Offic. Anal. Chem. 54(6): 1426-1429; 1971.* (9 references)

The separation of 2,3-dichlorodibenzo-*p*-dioxin, 2,3,7-trichlorodibenzo-*p*-dioxin, and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin from polychlorinated biphenyls by column chromatography on aluminum oxide is described. Polychlorinated biphenyls were eluted first with 1% methylene chloride-hexane and chlorodioxins were then eluted with 20% methylene chloride-hexane. Recoveries of both polychlorinated biphenyls and chlorodioxins approximated 100%. (Author abstract be permission)

72-0396. Williams. D. T.; Blanchfield, B. J. (Research Laboratories, Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa 3, Ontario, Canada). **Thin-layer chromatographic separation of two chlorodibenzo-*p*-dioxins from some polychlorinated**

biphenyls and organochlorine pesticides. *J. Ass. Offic. Anal. Chem. 54(6): 1429-1431; 1971.* (7 references)

A thin layer chromatographic procedure is described for isolating 2,3,7,8-tetrachlorodibenzo-*p*-dioxin and octachlorodibenzo-*p*-dioxin. This method separates these compounds from polychlorobiphenyls and organochlorine pesticides. After isolation by thin-layer chromatography, the chlorodibenzo-*p*-dioxins are analyzed by using electron-capture gas chromatography. The application of the method to corn oil is discussed. (Author abstract by permission)

72-0397. Egan, H. (Lab. of the Government Chemist, London, England). **Problems and progress in analytical methods.** *Food Cosmet. Toxicol. 9(1): 81-90; 1971.* (46 references)

Pesticide residue methodology is reviewed with reference to the sensitivities of analytical methods for nitrates, nitrites, and nitrosamines; polychlorobiphenyls; and trace metals in food and/or water. The general pattern has been for the development of methods sensitive to about 0.1 ppm or, where circumstances call for greater sensitivity, to about 0.1 ppb. For the detection of some compounds and their metabolites, there may be a call for even more sensitive methods than are currently available. Chromatographic separation systems are frequently used not only for clean-up and estimation but also for preliminary identification of trace constituents. This is acceptable where the nature of the residue is known in advance, though unnecessary if the substrate of interest can readily be shown to contain little or no organically bound (or total) phosphorus. Completely unequivocal confirmation of the identity of unknown residues is possible with high-resolution mass spectroscopy. Polychlorinated biphenyls can be separated (along with *p,p'*-DDE) from pesticide residues by means of a silica-gel column. Provided the interest relates to total residue, X-ray spectrometry, ultraviolet emission spectrography, and atomic absorption spectrometry are available for lead, copper, and a number of other metals. New chromatographic techniques are able to distinguish various forms of organically bound mercury from another, and from inorganic mercury. Identification and measurement of limiting nutrients in water would be greatly eased by improved analytical methods for low levels of phosphorus and various nitrogen compounds.

72-0398. Helling, C. S. (Plant Science Res. Div., ARS, USDA, Beltsville, MD 20705). **Pesticide mobility in soils: I. Parameters of thin-layer chromatography.** *Soil Sci. Soc. Amer. Proc., 35(5): 732-7; 1971.* (16 references)

Soil thin-layer chromatography (TCC), a recently developed method, was used to study the movement of pesticides in soils. This method, analogous to conventional TLC and approximating natural conditions of pesticide mobility in soils, used water as the solvent. The mobility (Rf) of pesticides was unaffected by the soil consistance of thickness of the soil layer, temperature, movement distance, or the sample size. The water flux was affected by the direction of flow, the addition of inorganic ions to the solvent, or by addition of organic compounds or inorganic salts to the soil. At concentrations greater than 0.5 M sodium chloride, the mobility of 2,4-D and atrazine were markedly diminished. Conversely, this higher salt concentration caused the movement of paraquat. Of the three methods of detecting pesticides on the plates, autoradiography was found to be more satisfactory than either radiochromatogram scanning or zonal extraction.

72-0399. Helling, C. S. (Plant Science Res. Div., ARS, USDA, Beltsville, MD 20705). **Pesticide mobility in soils: II. Applications of soil thin-layer chromatography.** *Soil Sci. Soc. Amer. Proc. 35(5): 737-43; 1971.* (39 references)

Soil thin-layer chromatography (soil TLC) on Hagerstown silty clay loam plates was used to group 40 pesticides into five categories based on relative mobilities. Class 4 and 5, the highest mobilities were comprised of organic acids. The low and intermediate mobility groups, Class 2 and 3 consisted of the *s*-triazines and the phenylureas. The organic cations (diquat, paraquat), and chlorinated hydrocarbons are in Class 1, immobile. In no case did the combination of two or more pesticides affect the mobility of the other. Methyl esters and metabolites of several compounds were less mobile than the parent compounds but were more volatile. Tween 20 (1% sol.) increased 2,4-D movement whereas 0.5% solutions of other surfactants were ineffective with other herbicides. Removal of organic matter increased both the mobility and lateral diffusion of chloropropham, propham, picloram, monuron, and diuron while retarding simazine and diphenamid. The Rf of atrazine was unaffected by this. Increasing the soil pH from 5.0 to 6.5 increased the mobilities of dicamba and fenac. In a comparison of soils, diphenamid was immobile in calcium-montmorillonite, and moderately mobile in kaolinite and Hagerstown sicl.

72-0400. Helling C. S. (Plant Science Res. Div., ARS, USDA, Beltsville, MD 20705). **Pesticide mobility in soils: III. Influence of soil properties.** *Soil Sci. Soc. Amer. Proc. 35(5): 743-8; 1971.* (17 references)

The influence of different soil parameters on the movement of pesticide was studied by use of simple correlation and multiple linear regression analyses. Soil thin-layer chromatography was used to determine the mobilities of 12 pesticides on 14 different soils. The mobility of nonionic compounds was inversely related

to their adsorption, the moisture capacity, the cation-exchange capacity, and the clay content of the soil. The mobility of the acidic compounds (2,4-D, dicamba, fenac, and picloram) was directly related to soil pH and inversely with picloram adsorption. Increased water flux positively affected pesticide mobility. There was a tendency for the movement of acidic pesticides to vary directly with the clay content of montmorillonitic soils and inversely with the nonmontmorillonitic soils. Movement of pesticides was predicted from regression equations. The parameters, field moisture capacity, water flux, and often simazine or chlorpropham adsorption terms, which appear in the equations are highly correlated with the soil organic-matter content which does not appear in the regression equations. The average deviation from predicted values for all soils and pesticides was 0.04 Rf units.

72-0401. Leoni, V. (Instituto di Ingiene dell' Universita di Roma, Piazzale delle Scienze, 5, Rome, Italy). **The separation of fifty pesticides and related compounds and polychlorobiphenyls into four groups by silica gel microcolumn chromatography.** *J. Chromatogr. 62(1): 63-71; 1971.* (13 references)

An analytical scheme used in the study of the pollution of surface water by pesticides in Italy is described. Pesticides and polychlorobiphenyls were separated into four groups by chromatography on a silica gel microcolumn. Pesticides present in the fractions eluted from silica gel shown were identified by GLC using an electron-capture detection. Several organophosphorus pesticides (ronnel, parathion, dursban, malathion and diazinon) were also identified in the waters by the technique described, the persistence of which in the environment had not previously been suspected. (Author abstract, edited)

72-0402. Geike, F. (Biologische Bundesanstalt fuer Land-und Forstwirtschaft, Institut fuer Pflanzenschutzmittelforschung, D 1 Berlin 33 German Democratic Republic). **Duennschichtchromatographisch-enzymatischer Nachweis und zum Wirkungsmechanismus von Chlorkohlenwasser-Stoff-Insektiziden. III. Nachweis durch Phosphatase-Hemmung. [Thin-layer chromatographic enzymatic identification and mechanism of action of chlorinated hydrocarbon insecticides. III. Identification by inhibition of phosphatase.]** *J. Chromatogr. 61(2): 279-283; 1971.* (14 references) (German)

Chlorinated hydrocarbon insecticides such as DDT, DDD, DDE, aldrin, dieldrin, heptachlor, endosulfan were chromatographed on silica gel G layers with cyclohexane as a carrier. Enzymatic identification of the chromatographed compounds was carried out with acid and alkaline phosphatase utilizing nitrophenyl phosphate or naphthyl phosphate as substrates for enzyme activity. Both acid and alkaline phosphatases were inhibited by UV-irradiated (1 hr exposure following chromatography) and the non-irradiated compounds. However, alkaline phosphatase appeared to be inhibited to a larger extent by part of the DDT group insecticides while acid phosphatase appeared to be more sensitive to most of the cyclodiene derivatives. The reaction for the detection of the above compounds showed higher sensitivity when naphthyl phosphate rather than nitrophenyl phosphate was utilized as a substrate. The lower detection limits ranged from 2 to 150 *mu*g depending on the pretreatment of the investigated compound and on the utilized substrate. The question whether the observed inhibition of phosphatase enzymes may constitute health hazards related to bone developmental processes in children, requires further research.

72-0403. Tuinstra, L. G. M. Th.; Graaf, J. B. H. D. de (Government Dairy Station, Leiden, The Netherlands). **Data processing of GLC pesticide analyses by means of a time-shared computer system.** *Chromatographia 4: 468-71; 1971.* (5 references)

A computer-processing program was developed for analysis of gas-liquid chromatographic data on organochlorine pesticides in various products. After sample injection, absolute retention times and peak areas are punched on paper tape (ASCII code) via an electronic integrator in combination with a Teletype. The data are then entered in a time-shared computer, where a quantitative evaluation (in terms of mg/kg) is performed by a program written in Fortran. The program is able to adjust small deviations in retention time; neglect irrelevant peaks; warn when the linearity range of the electron capture detector is exceeded, and compare product pesticide content with known residue tolerances. Computation costs are about $1.50 for 200 analyses per month.

72-0404. Colas, A. (Natl. Research Inst. for Applied Chemistry, city not given, France). **Pollution de l'eau par les pesticides. [Water pollution from pesticides.]** *Chim. Ind.-Genie. Chim. 104(14): 1711-1718; 1971.* (17 references) (French)

Water pollution with pesticides as affected by the nature of the compounds and by the mechanism of their transfer into the water system are discussed along with various procedures for their analytical determination. Adsorption chromatography on magnesium silicates (florisil) for the purification of water sample extracts is considered to be the most popular procedure, whereby petroleum ether is used for elution. BHC, DDT, aldrin and heptachlor have rather close elution regions therefore modifications of this technique are required when separation of these compounds is dealt

with. Extraction methods such as adsorption on activated charcoal or ion exchange resins for various pesticides are reviewed. The Research Instituted for Applied Chemistry focused its activity on 2 main groups of insecticides in the recent years. They included chlorinated organic compounds such as BHC, heptachlor, DDT and dieldrin and thiophosphorus derivatives such as parathion, malathion and diazinon. In addition, herbicides on the phenoxyalkane group (phenoxyacetic derivatives) were determined in water and methodology for the determination of pentachlorphenols was developed. Organochlorine insecticides were determined by gas chromatography following extraction with petroleum ether from 50 liter water samples; their microcoulometric determination was made in hexane or benzene solution. Separation of phosphorus insecticides was carried out by means of a thermoionic detector working with cesium between 200 and 210°C. The sensitivity of the apparatus was of the nanogram level order as deduced from determinations carried out with diazinon, methyl parathion, parathion and malathion. Phenoxyacetic herbicides were determined by chromatography of their methyl esters. Extractions from distilled water, industrial or polluted river water and waste water samples were carried out to establish the optimal conditions for this operation for the mentioned herbicides. Chloroform or methylene chloride appeared to be the most suitable solvents to be utilized at pH=2 for the extraction of these compounds. The colorimetric method which had been developed for the determination of pentachlorphenol and lauryl pentachlorphenol and their sodium salts included hydrolysis of the salt derivatives and spectrophotometry of a chloroform soluble copper complex at 4500 A.

72-0405. Whiteoak, R. J. (Fisons Ltd., Agrochemical Div., Chesterford Park Research Station, Saffron Walden, England). **Residue determinations following the use of Lovozal acaride.** *Proc. Soc. Anal. Chem. 8(10): 218-219; 1971.* (2 references)

The new acaricide Lovozal is based on the active ingredient fenazaflor (5,6-dichloro-1-phenoxycarbonyl-2-trifluoromethylbenzimidazole, NC 2983). Methods for the routine determination of residues in apples and pears and also in soil and animal tissues are presented. The first method pertains to total fenazaflor plus NC 2983, together with the hydroxylated metabolite (5,6-dichloro-4-hydroxy-2-trifluoromethylbenzimidazole). Acidic hydrolysis of an ethyl acetate extract, after separation of NC 2983, liberates the free 4-hydroxy metabolite, which is methylated for gas-liquid chromatographic determination on a nonpolar column. Limits of detection are 0.02 ppm for each compound. A simplified method for determining individual residues of fenazaflor and NC 2983 is based on partition of these chemicals between hexane and acidified aqueous methanol. The method will readily detect down to 0.2 ppm of each, with at least 95% separation.

72-0406. Shmigidina, A.M. (All-Union Res. Inst. of Hygiene and Toxicology of pesticides, polymers and plastics, Kiev, USSR). **Obankuzheniye nitrofenol'nykh pestitsidov na tonkosloynykh khromatogrammakh. [Detection of nitrophenolic pesticides on thin-layer chromatograms.]** *Gig. Sanit. 36(9): 77-78; 1971.* (3 references) (Russian)

Nitrophenolic pesticides are detected by direct reduction with hydrogen to their corresponding aminoderivatives on the thin-layer chromatogram and then identified by means of a ninhydrin reagent. Hydrogen is generated by zinc (included in the silica gel layer) and acetic acid interaction. The preparation of the chromatoplates is described. The procedure had been applied for the determination of acrex (4,6-dinitro-2-(1-methyl-*n*-propyl)*iso*-propylphenyl carbonate), karatan or dinoseb extracted from plants, water, air samples or biological materials. Chloroform had been utilized as a carrier solvent for acrex and dinoseb from biological material and a solvent system consisting of *n*-hexane: acetone (4:1) had been utilized for the determination of acrex and karatan from water, air or plant samples. The spraying reagent included a 0.25% ninhydrin solution in alcohol: glacial acetic acid, 10:1. The chromatoplates were kept at 100eC for 5 to 7 min after spraying. Acrex, karatan and dinoseb produced pink, violet and grey-black spots respectively; their Rf with chloroform as a carrier was 0.78, 0.79 and 0.28 resp. and 0.48, 0.49 and 0.03 resp. when the *n*-hexane:acetone system was utilized. The sensitivity of the reaction for each compound in the same order was 1, 2 and 2 micrograms respectively.

72-0407. Szokolay, A.; Uhnak, J.; Madaric, A.; Sackmauerova, M. (Research Inst. of Hygiene, Bratislava, Czechoslovakia). **Analyticke problemy rezidui chlorovanych insecticidov v potravinach zivocisneho povodu. [Analytical determination of residual amounts of chlorinated insecticides in animal food products.]** *Prum. Potravin, 22(11): 349-350; 1971.* (13 references) (Czech)

A method for the determination of residual amounts of chlorinated insecticides in animal food products is described. Sodium sulfate-dehydrated food samples are subjected to petroleum ether extraction (removal of lipids) and acetonitrile treatment. The chlorinated insecticides contained in the acetonitrile fraction are then reextracted with hexane or petroleum ether and purified on a chromatographic column consisting of alternate layers of sodium sulfate and fuming sulfuric acid-treated celite. The purified extract is utilized for

semiquantitative analysis by thin-layer or gas chromatography following concentration in a vacuum evaporator. Application of this method to samples with known amounts of 7 chlorinated insecticides yielded a maximum error of 20% indicating a satisfactory accuracy for routine food testing. Satisfactory separation of *alpha* and *gamma* BHC isomers can be achieved on Xe-60 columns while *beta* and *delta*-isomers yield common peaks. The combination of gas chromatography on universal columns with fast identification techniques by thin-layer chromatography is suggested for practical purposes.

72-0408. Visweswariah, K.; Jayaram, M.; Majumder, S. K. (Central Food Technological Research Inst., Mysore-2A, India). **Qualitative tests for the detection of certain commonly used organochlorine insecticides.** *J. Food Sci. Technol. 8(2): 77-79; 1971.* (11 references)

Color changes are reported for eight organochlorine insecticides hydrolyzed with monoethanolamine and subsequently treated with silver nitrate solution. After an optimum one-hour hydrolysis, aldrin and endrin gave white turbidity; technical grade BHC, a new BHC isomer, captan, chlordane, DDT, and lindane (*gamma* -BHC) remained clear, with a straw-yellow tinge. The addition of 1 ml 0.1 N silver nitrate produced various color changes in all the pesticides within five minutes, thus facilitating their rapid detection. With the silver nitrate, there was a distinguishable difference in colors depending on concentration. Between 1-350 micrograms of pesticide there were no color changes. At 400-650 micrograms, there was no immediate formation of turbidity or precipitate; excepting lindane and technical-grade BHC, all pesticides gave clear solutions. Between 700-950 micrograms all pesticides except chlordane gave pale turbid solutions of different colors. These changes in color or solution clarity will help not only in the detection of the various pesticides but also in their quantitative evaluation.

72-0409. Abbott, D. C. (Laboratory of the Government Chemist, Cornwall House, Stamford St., London, S. E. 1, England). **IUPAC Commission on the development, improvement, and standardization of methods of pesticide residue analysis.** *J. Ass. Offic. Anal. Chem. 54(6): 1332-38; 1971.* (22 references)

Methods for organochlorine pesticide residue analysis (which includes: PCB's, low moisture samples, chlorinated naphthalenes, extraction of residue from fish, mammals and poultry tissue, and chlorodioxins), organophosphorus residue analysis, fumigant residue analysis, organomercury residue analysis, and rethrin and synergist residue analysis are presented.

72-0410. Gupta, D. S.; Mishra, R. C. (Dept. of Entomology, Haryana Agricultural U., Hissar, India). **Status of bioassay in the determination of insecticide residues.** *Pesticides 5(8): 18-26; 1971.* (40 references)

The bioassay method for determining insecticide residues in soils, plant tissues, and crops does not require costly and specialized equipment or an extensive background in analytical chemistry. This is in contrast to such widely used methods as chemical analysis, radiometry, and enzymatic inhibition. Another advantage of bioassay is the ability of the method to detect toxic metabolites with different chemical behavior than the parent compound. Use of the test insect *Drosophila* allows residues to be detected in a tenth or even a hundreth part per million. For some insecticides, the insect *Daphnia* is sensitive to two to five parts per million. Available data show that bioassay is no less accurate than chemical analysis and in most cases gives comparable results. In the case of DDT, aldrin and chlordane, the two methods are in close agreement. For lindane, BHC, and toxaphene, chemical analysis yields higher values because of its ability to detect nontoxic degradation products of the insecticides. The reverse is true with heptachlor, which is normally changed to the more toxic heptachlor epoxide. The organophosphates (parathion, dimethoate, azinphosmethyl, diazinon, and malathion) and carbaryl show similar results by both methods.

72-0411. Ivey, M.C.; Claborn, J.C. (Entomology Research Div., Agr. Res. Serv., USDA, Kerrville, TX 78028) **Gas-liquid chromatographic determination of ronnel (o,o-dimethyl o-2,4,5-trichlorophenyl phosphorothioate) and the oxygen analog of ronnel (dimethyl 2,4,5-trichlorophenyl phosphate) in tissues of cattle.** *J. Agr. Food Chem. 19(6): 1256-8; 1971.* (4 references)

A gas chromatograph equipped with a flame photometric detector provided a highly sensitive method for determining residues of ronnel and its oxygen analog in animal tissues. With extraction and cleanup 0.002 ppm of ronnel and 0.005 ppm of the oxygen analog could be detected, and the recoveries were 75-95% for ronnel and 80-100% for the oxygen analog. (Author abstract reprinted by permission of the American Chemical Society.)

72-0412. Li, M. F.; Jordan, C. (Halifax Lab. Fisheries Research Board of Canada, Halifax, Nova Scotia, Canada). **Use of spinner culture cells to detect water pollution.** *J. Fish Res. Board Can. 26(5): 1378-82; 1969.* (11 references)

It was determined that mouse fibroblast L-cells in spinner culture are sensitive to various pesticide (DDT, malathion, lindane) and one herbicide (2,4-D ester). In

the case of DDT the inhibition of L-cell growth was strictly concentration dependent. Since the bioassy system is so simply reproduced, it should make it a useful tool in water pollution studies.

72-0413. Schilling, P.; Gal, S. (Forschungsabteilung der Firma Haco AG, Guemligen/BE, Switzerland). **Gas Chromatographic determination of dichloromethane residues in decaffeinated roasted coffee.** *Z. Lebensmitt.-Untersuch. 146(5): 255-58: 1971.* (3 references) (German)

A method for the determination of dichloromethane residues in decaffeinated roasted coffee is reported. The solvent is isolated by means of water vapor distillation succeeded by extraction from condensate with hexane. A gas chromatograph using an electron-capture detector is used for the quantitative determination.

72-0414. Koessler, F.; Wolburg, I. (Division of Occupational Physiology, German Central Institute for Occupational Medicine, Berlin-Lichtenberg, W. Germany). **Stoffwechselfunktionen von Mikroorganismen als Indikatoren fuer toxische Substanzen. [Metabolism of microorganisms as indicators for toxic substances.]** *Z. Gesamte Hyg. 17(5): 317-21; 1971.*

One way in which toxic substances have an influence on microorganisms is by changing the growth rate of their oxygen consumption. This change can be quantitatively measured under limited conditions. The intensity of emitted light, which may be measured, is changed by luminous bacteria. A more sensitive indicator of toxic influences than growth rate or oxygen demand is the bioluminescence of *Vibrio luminosus* which immediately reacts at very low concentrations. Light emission decreases for some industrial toxicants such as (benzene, nitrobenzene, toluene, xylene, and monochlorobenzene and insecticides such as Demphion and methyl parathion) at concentrations between 2000 ppm (benzene) and 8 ppm (methyl parathion). Because of the sensitivity of the luciferin-luciferase reaction, luminous bacteria are appropriate for testing new substances as to their effect on biological reactions.

72-0415. Elvidge, D. A. (Qual. Control, Analytical Res., Boots Pure Drug Co. Ltd., Pennyfoot St., Nottingham, England). **The gas-chromatographic determination of 2,3,7,8-tetrachloro-*p*-dioxin in 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 2,4,5-T ethylhexyl ester, formulations of 2,4,5-T esters and 2,4,5-trichlorophenol.** *Analyst 96(1147): 721-7; 1971.* (11 references)

A gas chromatographic method for the determination of trace amounts of a toxic imputity, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, is described. A purified extract of the sample was subjected to gas chromatography on a column containing either 2% of OV-17 on Diatomite CQ or 1% of Hi-Eff 8 BP on Gas-Chrom Z with electron-capture detection. 2,4,5-T and 2,4,5-trichlorophenol were purified by chromatography of an ether extract of the sample on an alumina column, followed by shaking with sulfuric acid. For 2,4,5-T esters and formulations, saponification and chromatography on a Celite-sulfuric acid column followed by chromatography on a column of alumina was necessary. Recoveries of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin ranged from 89-98%, and the standard deviation of the method at a level of 0.3 ppm was 0.03 ppm. The limit of detection was about 0.05 ppm. (Author abstract by permission)

72-0416. Bevenue, A.; Ogata, J. N. (Dept of Agricultural Biochemistry, U. of Hawaii, Honolulu, HA 98622). **A contributive error from analytical reagents in the analysis of chlorophenoxy acids and pentachlorophenol by electron-capture gas chromatography.** *J. Chromatogr. 61(1): 147-148; 1971.* (8 references)

In the analysis of esters of chlorophenoxy acids and ethyl or methyl derivatives of hexachlorophene and pentachlorophenol (PCP) in plant and animal tissue and water samples, basic analytical grade reagents are frequently employed to adjust the pH of the sample mixture prior to isolation of the desired compounds. The reagents include potassium hydroxide, sodium hydroxide, ammonium hydroxide, sodium carbonate, and sodium bicarbonate. When added in 0.1 M quantities to 2800 ml of tapwater prior to hexane extraction, each of these reagents contributed extraneous or additive false data in the ppt range to PCP values obtained by electron-capture gas chromatography. Other and larger amounts of extraneous components from some of the reagents could magnify the error or confuse the gas chromatographic data in the analysis of chlorphenoxy acids.

72-0417. Meinard, C. (Lab. de Recherches physico-chimiques appl., Dept. de Biol. appl., Societe Procida, St. Marcel, 13 Marseilles 11eme, France) **Un agent chromogenique pour detecter les herbicides phenoxy-acetiques sur des plaques de chromatographie en couche mince. [A reagent for the detection of phenoxyacetic herbicides on thin-layer chromatography plates.]** *J. Chromatogr. 61(1): 173; 1971.* (5 references) (French)

A chromotropic reagent for the detection of phenoxyacetic acids on thin-layer chromatography plates is described. The reagent, consisting of 4 g chromotropic acid, 40 g water and 56 g sulfuric acid, was sprayed on samples chromatographed on silica in chloroform:acetic acid (9:1). The color was developed

by heating the sprayed plates at 160° C. Violet spots on a white background indicated the presence of phenoxyacetic acids. Detection limits for 2,4-D or MCPA are of 0.05-0.1 microgram and of 0.1-0.2 microgram for 2,4,5-T.

72-0418. Lemperle, E.; Kerner, E. (Staatl. Weinbauinstitut, Mikrobiol. Abt. D-7800 Freiburg i. Br., Merzhauser Str. 119, Germany.) **Bestimmung des Wirkstoffrueckstandes auf Weintrauben, in Traubenmost und in Wein nach Anwendung von SCLEX (ORT 8890 F, Dichlozolin). [Determination of the fungicide residue on grapes, in must and wine after application of SCLEX (Dichlozoline).]** *Z. Anal. Chem. 256(5): 353-56; 1971.* (3 references) (German)

A quantitative gas-chromatographic method for the determination of the fungicide SCLEX [3-(3,5-dichlorophenyl)-5,5-dimethyloxazolidinedione-2,4] on grapes, in must, and wine is described. The residues are extracted with chloroform and after purification on a florisil column analysed by electron-capture gas-chromatography. The limit of detectability is 0.05 ppm or better. The average recovery of residues was 98% on grapes, 95% in must and 96% in wine. (Author abstract by permission).

72-0419. Volkova, V. A.; Novozhilov, K. V. (All-Union Research Institute Institute for Plant Protection, Leningrad, USSR). **Kolorimetricheskii metod obnaruzheniya mikrokolichestv fosfamida v rastitel'nom materiale. [Colorimetric method of detecting trace amounts of phosphamide (dimethoate) in plants.]** *Vop. Pitan. 30(5): 82-83; 1971.* (3 references) (Russian)

The insecticide was extracted from the plants with chloroform and subjected to thin-layer chromatography in a hexane:ethyl acetate solvent system. After treatment with bromine vapor the insecticide formed a yellow band with an Rf of 0.15. The band was scraped off and extracted with chloroform, filtered, and distilled. The residue was taken up in perchloric and concentrated sulfuric acids. A drop of 0.1% 2-dinitrophenol was added followed by neutralization with 25% sodium carbonate. The resultant yellow color was bleached with hydrochloric acid. Color was then developed with 2 ml of 2.5 N ammonium molybdate in 5 N sulfuric acid followed by 3 drops of stannous chloride. The absorbance was measured on a photocolorimeter using a red filter. Experiments with cabbage, beets, and lettuce were 89 to 100% accurate.

72-0420. Murano, A.; Fujiwara, S.; Horiba, M.; Miyamato, J. (Research Department, Osaka Works, Sumitomo Chemical Co., Ltd. Kasugade-cho, Konohana-Ku, Osaka, Japan) **Quantitative determination of a new synthetic pyrethroid, resmethrin** *Agr. Biol. Chem. 35(8): 1200-7; 1971.* (14 references)

The sensitivity of three methods for the quantitative determination of resmethrin (5-benzyl-3-furylmethyl-*dl-cis,trans*-chrysanthemate) is compared. Using TLC-colorimetry in a petroleum ether:ethyl ether (100:12) solvent system and using a UV lamp for spot detection, resmethrin was separated from related compounds. Reaction with hydroxylamine to form the hydroxamic acid gave a reddish-brown color. A TLC-UV method is described in which a chloroform solution of technical resmethrin, after TLC separation, was colored reddish to dark brown by the addition of acetic anhydride and sulfuric acid. Resmethrin was spectrophotometrically determined at UV region with maximum absorbances at 298 and 335 m*mu*. The method found to be superior in reliability of analytical results and simplicity of operations was a GLC method employing a hydrogen flame ionization detector and using dicyclohexylphthalate as an internal standard. A DISC type integrator was used for calculation of peak areas. The GLC method is equally sensitive in determination of *cis*- and *trans*-isomers of resmethrin and may be used for accurately determining the ratio of isomers in a mixture. The first two methods, however, are more sensitive to *trans*-resmethrin than *cis*- resmethrin.

72-0421. Visweswariah, K.; Jayaram, M. (Central Food Technological Research Institute, Mysore 2A, India). **Detection and quantitative determination of certain chlorinated pesticides by micro-thin-layer chromatography.** *J. Chromatogr. 62(3): 479-84; 1971.* (14 references)

Spot diameter and visual extinction methods on micro-thin layer chromatography (micro-TLC) slides have been investigated as a possible combination for the rapid detection and quantitative estimation of certain chlorinated insecticides. The preparation of the micro-TLC slides was elementary, quick and no activation was required. The concentrations of the pesticides to be detected were 10, 5, 2, 1, 0.5, 0.2, 0.1, 0.05 and 0.02 *mu*g. 1% *o*-tolidine was sprayed over the plates to bring out the various intensities of color. A visual extinction method, diameter of the spot and spot intensity were used for quantitative determination. The clean-up procedure (using hexane and acetonitrile) was done before chromatographic analyses. The minimum detectable quantity by visual extinction for DDT, lindane, captan and BHC, were in the range 0.015 to 0.02 *mu*g; DDD, DDA, and DDE could be detected at the 0.3 *mu*g level and higher. When the quantity of the pesticide in relation to the area of the spot was investigated, a linear relationship was observed in all cases from 1 to 4 *mu*g. It was found that by this method pesticides can be recovered and estimated within 6% error. DDT and captan were recovered in the range 90-92%.

72-0422. Hotya, J. (Bekes County Public Health Epidemiology Station, Bekescsaba, Hungary). **Uj, tomegszuresre es klinikai laboratorium vizsgalatra alkalmas kolineszteraz aktivitas meghatarozas. [A new procedure to determine cholinesterase activity suitable for mass screening as well as for clinical laboratory examination.]** *Egeszsegtudomany 15(3): 291-97; 1971.* (13 references) (Hungarian)

Two new procedures have been elaborated upon to determine cholinesterase activity. Anyone who has been exposed to pesticides containing organic phosphate esters, should have the cholinesterase activity in their blood determined. The present methods (paper test and other rapid procedures) are not well suited for this purpose. The two methods proposed are titrimetric (bromthymol blue is the indicator used to a greenish-yellow endpoint) and spectrophotometric (625 nm) analyses. These methods are suitable for mass screening and for determination of the cholinesterase activity in the whole blood, in the erythrocyte as well as in the plasma using the same reagent solution (acetylcholine bromide) for both methods.

See also **72-0282** **72-0263** **72-0289** **72-0300** **72-0329**

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